PUBLIC WORKS

Feb. 1955

CITY, COUNTY AND STATE

W. D. Hurst, Commissioner of Public Works and Buildings for Winnipeg, Manitoba, is responsible for the many engineering activities of that Canadian city. He is currently a Director of the APWA. More on page 22.

how much does it cost...

to have *Safest* CHLORINATION?

Nothing—when you buy a Fischer & Porter Chlorinator. That's true because fool-proof safety features are already engineered into this modern, instrument-type chlorinator.

> The F&P Chlorinator is instrument engineered from top to bottom to be absolutely safe in any emergency—and the safety features respond instantly. The mechanical design—without hydraulic devices to introduce time lag—make this a certainty . . .

In the F&P Chlorinator you can take a hammer and shatter the flowmeter tube—and the chlorinator shuts down *instantly*.

In the F&P Chlorinator you can pull the flow setting needle valve right out of its socket—and the chlorinator shuts down *instantly*.

In the F&P Chlorinator you can shut off the ejector water supply while leaving the chlorine on—and the chlorinator shuts down *instantly*.

In the F&P Chlorinator a simple series of hand manipulations tests each safety component—or shows the reason for malfunctioning should it ever occur.

These safety advantages are yours in the Fischer & Porter Chlorinator. They cost you not one penny more at the outset, since the F&P Chlorinator is lower in first cost. They avoid constant costs of repeated safety tests and checks. They assure you against high costs of repairs and maintenance. We don't put our safety devices under a bell jar—they are right out in the open where you can see and touch them.

These engineered features—*instrument-type engineering*—make the F&P Chlorinator the safest ever built. And you get all these safety features *plus* ease of operation, dependability proven in over 600 operating units, complete corrosion resistance—everything you should have in a chlorinator—and you get them for even less cost in the initial purchase. Write today for full information, details on free trial offer, and *absolute guarantee of satisfaction.*

complete process instrumentation

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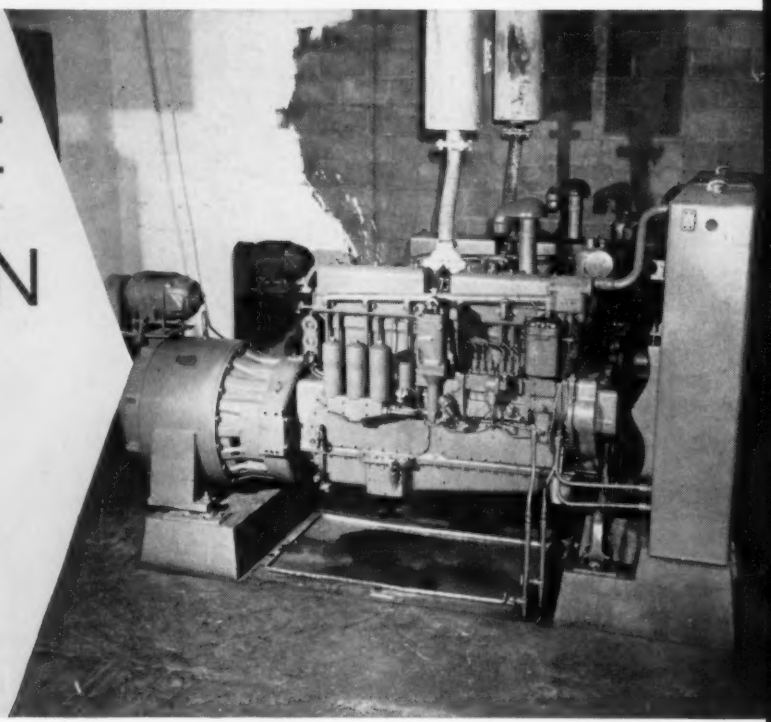
525 Fischer Road, Hatboro, Pa.

FP

18 YEARS SUCCESSFULLY MANUFACTURING CHLORINE CONTROL EQUIPMENT

HERE'S WHERE A WHOLE TOWN GETS ITS **POWER**



Offhand, there are two interesting things about the neat little city of Kanopolis, Kansas. It's almost dead-center in the U. S. And it's powered *entirely* by the two CAT* D13000 Diesel Electric Sets you see here.

The citizens of Kanopolis used to depend on another source of power, but it failed them whenever the wind was mean enough to kick dust around—which is often in this dry belt. Harvey E. Merrill and Paul F. Arensman, engineers in charge of the light plant, say, "We figured Cats were the best and most reliable engines we could get." So the city switched. Even Kansas dust can't run the gauntlet of this D13000's multi-step air cleaner.

Dependable 24-hour power is assured by other unique Caterpillar features, too. The crankshaft, for instance, is forged of specially selected steel, its bearing surfaces "Hi-Electro" hardened and finished to mirror-like smoothness. And superior construction like this has paid off for Kanopolis. The two electric sets have operated more than 26,000 hours each, with the down time being limited to one overhaul on each unit.

Another point helped sell the city officials. "We can get parts from only 30 miles away, any time. Even Sundays."

And during Kanopolis' night football season, when the power load jumps over 40%, there's hardly a light flicker in town as these big yellow diesels promptly pick up the extra burden.

Important, too, for economy-minded officials: the Caterpillar fuel system takes low-cost No. 2 furnace oil with no danger of fouling.

Your Caterpillar Dealer has self-regulating diesel electric sets from 20 to 117 KW, externally regulated sizes from 20 to 315 KW. He'll be glad to help you any way he can.

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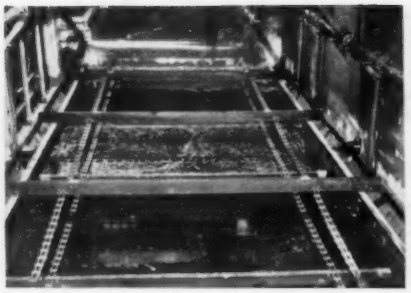
PUBLIC WORKS MAGAZINE

CONTENTS

February, 1955 **Vol. 86, No. 2**

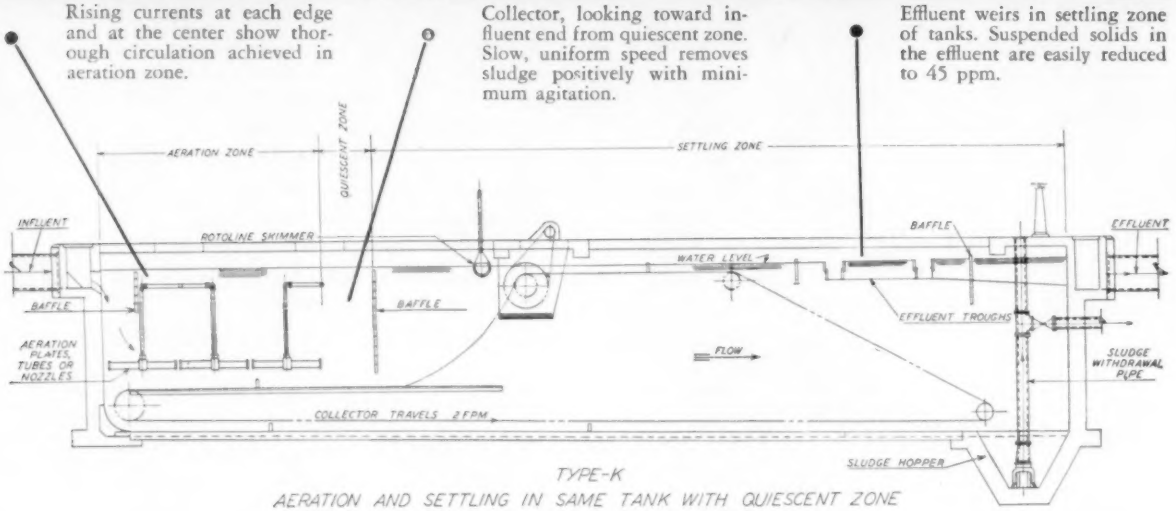
THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

Rising currents at each edge and at the center show thorough circulation achieved in aeration zone.



Collector, looking toward influent end from quiescent zone. Slow, uniform speed removes sludge positively with minimum agitation.

Effluent weirs in settling zone of tanks. Suspended solids in the effluent are easily reduced to 45 ppm.



TYPE-K
AERATION AND SETTLING IN SAME TANK WITH QUIESCENT ZONE
AFTER AERATION AND SLUDGE HOPPER AT EFFLUENT END

NOW! More effective, lower cost pre-aeration of sewage or waste

New LINK-BELT system combines pre-aeration and settling in a single tank

NOT only does the new Link-Belt pre-aeration system cut construction costs by eliminating separate tanks and their connecting piping — it also improves settling tank efficiencies. Violent aeration to prevent settling of heavy solids in aeration zone is unnecessary because they're collected along with the sludge in the settling zone. This, of course, ends the messy job of draining and cleaning the aeration tank manually.

Using only the correct volume of air produces a more gentle agitation. This increases flocculation . . . helps release more entrained gases . . . improves suspended solids settling rate . . . steps up B.O.D. removal. Even when chemicals are added to the sewage, proper mixing rate for maximum flocculation can be used. Sedimentation in aeration zone will not be a problem.

What's more, separated grease is removed immediately in the settling zone by the skimming action of the sludge collector. It is not re-mixed with the sewage in passing from the aeration zone to the settling zone.

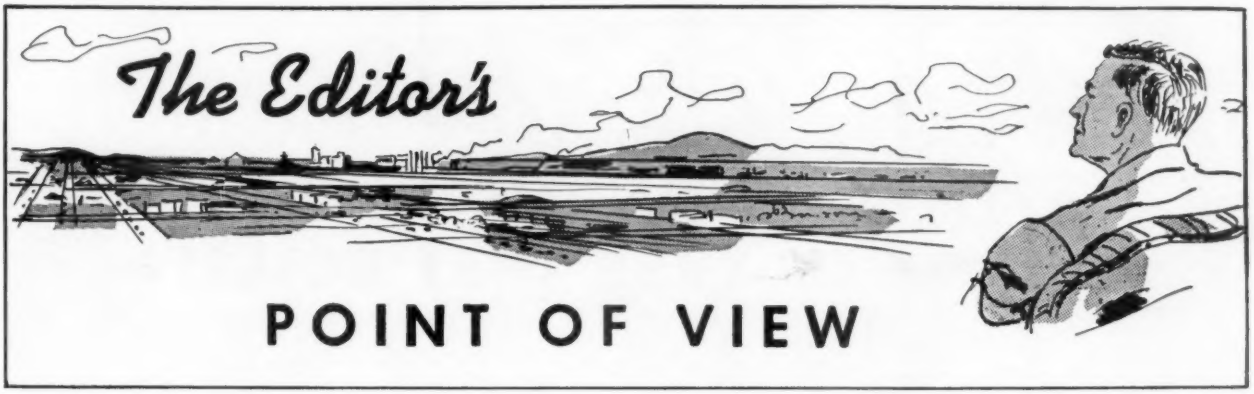
For complete information on pre-aeration and other efficient equipment in the broad Link-Belt line, call the Link-Belt office near you. An experienced sanitary engineer — working with you, your chemists and consultants — will help you get the finest in modern sewage, water or industrial waste treatment equipment. 13,342

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices in Principal Cities.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

Get full details of this month's products . . . mail your Readers' Service card today.



Public Health Service to Commission a Thousand Engineer Reserve Officers

ANNOUNCEMENT has been made by the Public Health Service that it will commission, during the next 18 months, an additional 5,000 reserve officers of whom about 1,000 will be engineers. It is hoped that 40 percent of the total can be added before June 30 of this year. In making the announcement, it was stated:

"Experience during World War II, and during the tense and often critical times since, leaves no room for speculation as to the need for a well-organized Reserve Corps, large enough to be effective, adequately trained, and ready for mobilization if and when a major national crisis develops.

"To be ready to deal with such a situation means that the public health forces of the country must be in a position not only to carry on necessary normal functions under abnormal conditions but also to take on vital new responsibilities as well. In these circumstances, the present public health forces of the Nation will need substantial augmentation.

"In carrying out its assigned responsibilities, the Service has two fundamental objectives: (1) Effective emergency utilization of professional personnel with training and experience in public health and (2) augmenting these forces with physicians and other professional people not normally working in the field of public health.

"The prime purpose of the entire program is the development of plans that will enable personnel in and out of the field of public health to serve to the best possible advantage in a national crisis. As part of this objective, the Service will use every possible resource to train officers of the Commissioned Reserve in the health problems associated with atomic, biological and chemical warfare and in other emergency public health problems.

"An officer in the emergency reserve would be called to active duty without his consent only in the event of a national emergency publicly recognized as requiring such action. Officers in the emergency reserve may request active duty at any time and will be considered for available assignments."

There is no question of the need for the type of action outlined above and the Public Health Service appears to be the only organization with the ability to attract qualified persons and to utilize their skills adequately. It has done considerable planning along the lines of personnel procurement, training and use and these plans appear sound. It is regrettable that the Army Medical Service dissipated its sanitary engineering resources completely following the war and adopted a plan, based on concepts of forty years ago, for it has a great responsibility and had a great opportunity. The Air Force has followed in the steps of the Army, doing nothing constructive; the Navy never has had any idea of what sanitary engineering can do. The Corps of Engineers does utilize engineers and has some positions where sanitary engineers can be used advantageously, but an organized program of the nature considered here does not exist.

Relative rank and pay are the same in the Public Health Service as in the Army, Navy and Air Force. It is a flexible service and offers many opportunities for non-medical professional scientists and engineers.

Many problems will be involved in the program. It is axiomatic that there must be a training program by which a reasonable proportion of the reserve officers can be given active duty training; and such training must be planned to test, develop and weed out unsuited personnel through the solution of typical specific field problems. It is assumed, though it is not mentioned in the announcement, that men will be commissioned in grades appropriate to their age and experience. There must be provision for promotion; and fair promotion is difficult to achieve in any reserve corps. Another problem, of course, lies in the probable inclusion in this reserve of those key men who would not, under any conceivable conditions, be called away from their regular jobs; but block promotion for other reservists.

We hope that this program can be put into operation on a basis that will meet the needs of this country. We recommend to our readers who are eligible that they find out what a Public Health Service reserve commission can do for them in providing an opportunity for most useful service to the country.

NEW-

a complete

well cleaning preparation

WELTONE

for cleaning and developing water wells

WELTONE is the *new, complete* well cleaning product that is quickly making a name for itself. WELTONE combines the well-known cleaning power of Calgon* with disinfecting and other chemicals into a highly soluble, safe powder. The exclusive dispersing action of WELTONE leads to high efficiency for both cleaning and developing water wells.

The powerful cleaning action of the chemicals combined in WELTONE is admirably demonstrated by the recent experience of a midwestern plant. One of the wells had fallen off from an original capacity of 600 gpm to pumping dry at 180 gpm. The plant decided to try to rejuvenate the well, and were persistent even after the first charge registered no improvement. After several more charges, however, the well delivered a steady *840 gpm with a drawdown of only 29 feet,* far surpassing the original capacity.

WELTONE is the answer to the demand for a complete well cleaning preparation. It is safe, easy to use, and inexpensive. Get the full story of the remarkable properties of new WELTONE by sending the coupon, or writing, for the free descriptive booklet.

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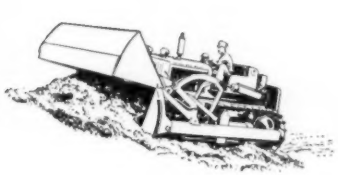

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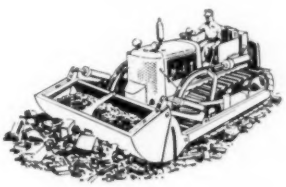
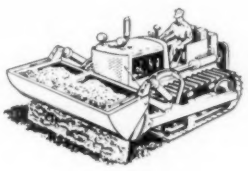
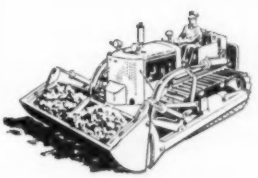


2. Crushes and compacts refuse



3. Transports and spreads earth cover



4. Grades and levels finished area

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DROTT

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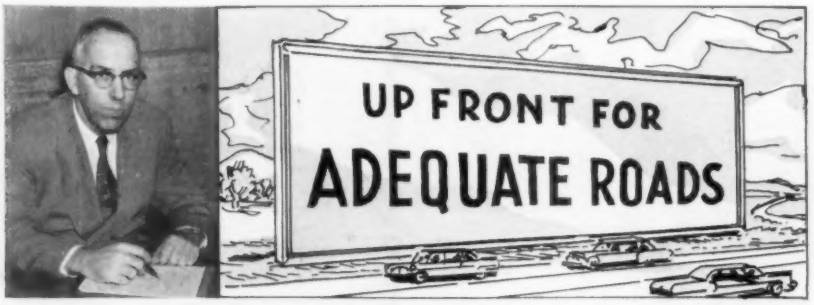

by LEO J. RITTER, JR.

Clay Committee — At the time of this writing, specific recommendations of the Clay committee to President Eisenhower concerning the nation's highway program have not been made public. However, it appears that the recommendation is going to be for the federal government to pick up the tab for $24 billion of highway construction during the next 10 years. This will be over and above normal expenditures (i.e. federal-aid). The recommendation will be for $550 million per year in regular federal aid for the primary and secondary systems. How does the overall program shape up? Basically the BPR has estimated that $101 billion will be required to meet the country's needs for the next ten years. Normal expenditures, by all levels of government, during the same period are expected to be $47 billion. This leaves a gap of $54 billion—if the federal congress goes along with the Clay committee proposals, $24 billion will be met by the federal government. This will still leave a deficiency of $30 billion—where will this come from?—it must come from local sources; state, county, city, and other local governmental units. However, if the federal congress does implement an increased federal program, this alone will be a tremendous step in the right direction. It is also likely that the committee will recommend the establishment of a separate federal commission, empowered to issue revenue bonds, which will be secured by excess income from the federal excise tax on gasoline.

Gadgeteering — We are much intrigued by two gadgets which have recently come to our attention. One of these is an electronic scale for weighing vehicles in motion, manufactured by the Cox and Stevens Aircraft Corporation, 630 Fifth Avenue, New York. This instrument, which involves an installation in the pavement, across the traffic lane, coupled with a remote indicator, instantly records axle weights for both single- and double-axle trucks. It operates at any vehicle speed, and also indicates vehicle speeds and axle spacings. The other is the comparatively new hydraulic self-loader which attaches to the front of a regular dump truck. Manufactured by Lodal, Inc., Norway, Michigan, the basic unit is a sort of scoop shovel. After the shovel is loaded, the material is raised up over the cab of the truck and emptied into the dump compartment. Attachments are available to convert the basic unit into a snow-plow, pickup sweeper, snow scoop, and refuse collector.

Tennessee Study — A paper presented at the Highway Research Board meeting in January by E. A. Whitehurst and W. A. Goodwin reports the results of a "Study of Pavement Slipperiness in Tennessee". Principal cause of slippery pavements covered in the study was found to be the susceptibility of certain limestone aggregates to polishing under the action of traffic; both asphaltic and Portland cement concrete pavements were examined.

Bituminous Mixtures — A recent issue of California Highways and Public Works carries an interesting article by Vaughn Marker of the Division of Highways. Mr. Marker describes an innovation in the construction of plant-mixed asphaltic surfacing. The revised process was based upon the hauling of the plant mixture in bottom-dump hauling units, instead of the conventional rear-dump machines. Key development was a spreader box which rested on the pavement and into which the mixture was dumped; the spreader box was then pulled along by the hauling unit to form a windrow of the desired size. When a paving machine was used, the material was picked up from the windrow by a mechanical loader and placed in the hopper of the paver. Principal advantages claimed for the method include reduction in hauling costs, continuous opera-

BLAW-KNOX ROAD WIDENER SPREADS 500 TONS PER DAY ON PENNSYLVANIA WIDENING JOB

This job really rolled for D. E. Smith, Inc., of Mifflin, Pa. Their contract called for widening ¾ths of the stretch from 18′ to 22′ and the balance from 20′ to 24′... spreading 2″ of fines in the bottom of a 3-foot wide trench and, after compaction, spreading 10″ of No. 4 crushed stone on top of the fines.

The Blaw-Knox Model 95 Road Widener sewed up this job at a schedule trimming clip... spreading 500 tons per day, or widening approximately 3200′ of highway every 10 hours!

Speedy operation is just one way Blaw-Knox Road Wideners step up profits. They also lay concrete without forms, handle asphaltic concrete, dirt, gravel, stone or any kind of aggregate. They handle any widening jobs from 2′ to 10′ widths. Your Blaw-Knox distributor will gladly show you the time-saving, money-making features of the Model 95 Widener. Call him today.

BLAW-KNOX BASE PAVERS LAY 400 TONS PER HOUR DEPTHS TO 20 INCHES WIDTHS TO 16 FEET

Two models available to cut weeks off base course schedule time! Blaw-Knox Base Pavers spread stone, slag, gravel, soil cement or crusher run aggregate *without segregation.* Straightedge leveling reduces the need for hand dressing behind the unit for accurate results.

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BLAW-KNOX also manufactures a "Complete Package" of concrete paving equipment

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tion of the paver, and easier control of the paver when pushing the loader rather than pushing a truck; careful control of the entire process is necessary. Changing the subject, a new annotated bibliography —Bibliography 17—is now available from the Highway Research Board; it has the title "Effect of Water on Bitumen-Aggregate Mixtures".

Names in the News — A. E. Johnson, immediate past president of the AASHO, is now filling the job of executive secretary, replacing Hal Hale, who resigned January 1 to go into the railroad business. Francis DuPont has become special assistant to the Secretary of Commerce; his job at the BPR is being filled by C. D. Curtiss, long-time Deputy Commissioner. Don Kennedy, of the Michigan Kennedys, is now president of the Portland Cement Association. Henry A. Barnes of Baltimore enjoyed the spotlight of national recognition when Newsweek featured him in a special report on the nation's traffic problem in its issue of December 27.

Mr. Robertson

A. R. B. A. announces the election of John N. Robertson, Director of Highways for the District of Columbia as President of the American Road Builders' Association. He succeeds Robert M. Reindollar, engineer consultant of Baltimore. In his capacity as Director of Highways, Mr. Robertson has been responsible for many extensive projects within the District of Columbia, and recently launched a $125 million program for highway improvements.

Midwestern Action — Reliable sources have it that Northwestern University's new Transportation Center—planned to provide a national center for education, research, and service to the transportation industry—is off and running. Underwritten by private industry, the Center's program will involve an expenditure of $8 million over the next 5 years.

Paradoxical — "S-D Day", December 15, seemed to be a big success, at least in our neck of the woods. Latest figure we saw was 45 fatalities in highway accidents for the country as a whole, compared with 60 on the same date a

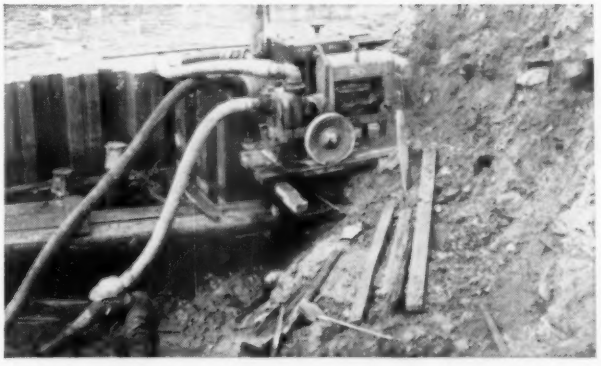
year ago, and an average daily toll of more than 100. Yet, as this is being written, American drivers have just finished belting one another for a total of 387 deaths over the two-day Christmas holiday—a new record of slaughter. Try to figure that one out. The only protection these days seems to be to assume that every other driver is just a plain, d - - - n fool.

From a Seat by the Side of the Road —Colorado voters woke up long enough to approve a $35 million bond issue for highway construction in the "mile high" state. Incidentally, Colorado is our home state, a fact of which we are proud. The fall meeting of the Tennessee County Highway Association quickly and indignantly voted down a proposal requiring a county highway engineer in that state to be a licensed engineer or have 5 years of experience in the field. A new booklet "You and Your Car" is now available from the Inter-Industry Highway Safety Committee, AAA, or National Safety Council, who jointly sponsored its publication. The Institute of Transportation and Traffic Engineering of the University of California (Berkeley) has a new gimmick—they are offering a graduate course to instructors of highway engineering; the course will be held from June 20 to August 12. 20 grants of $650 are being made by the Automotive Safety Foundation to aid those who might be interested in participating in the program. Illinois' toll road program has been delayed as a result of a federal court opinion, rendered late in December, that the state's toll road act may be unconstitutional.

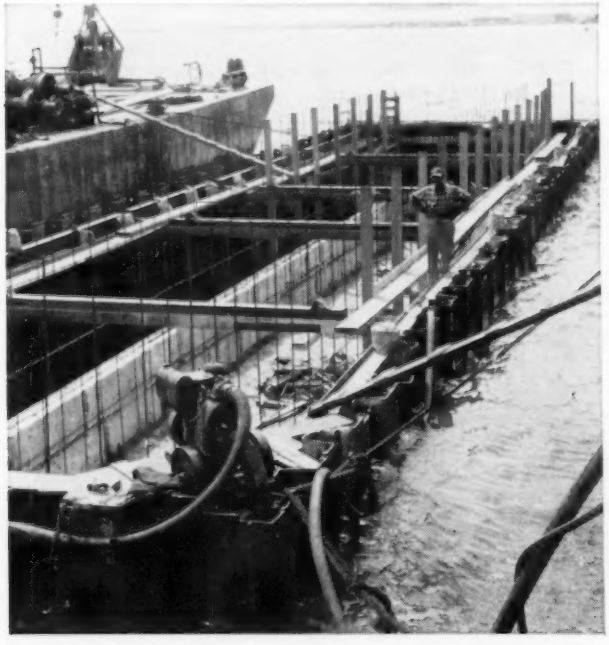
Wire Reinforcement — Sponsors of the fabric - in - asphalt process, wherein welded wire fabric is used to reinforce asphalt resurfacing over old concrete pavements, hit something of a snag last fall. The difficulty came when the reinforced resurfacing used on a section of the Pennsylvania Turnpike failed very shortly after its completion. Pending further research, cause of the failure has been laid to the use of large-size aggregate—up to 1½ inches maximum—in the paving mixture. In earlier (and later) successful applications of this method, dense-graded paving mixtures containing stone with a maximum size of ¾ inch had been used. The experience on the Turnpike was unfortunate; nonetheless the method has great merit and its use will continue to increase.

Jaegers prime faster, pull stronger, pump longer

SLOW PUMP SPEED HANDLES FAST WATER — Latrobe Construction Co., had to pave the slope of Loyalhanna Creek with 8" thick concrete 25' wide (equivalent to highway slab) when relocating U.S. 30, western Pennsylvania. This Jaeger 6P pump handled 1500 gpm of inflow at a speed of 1450 rpm. Ordinary 6" pumps, with smaller shells and impellers, require up to 1750 or 1800 rpm.



JAEGER PUMPS MAKE WET JOBS DRY — Two 4" and three 6" Jaegers were used to dewater the main pier cofferdam on this Milwaukee River bridge. Conservatively rated, they have capacity to dewater fast and sure-priming ability to keep jobs dry.



NEVER RACES TO PRIME — There's reason why this Jaeger 3P pump is being used to control seepage in this tremie sealed cofferdam on Frederick Snare Co.'s Raritan River Bridge job, N. J. Wherever priming is a problem, Jaeger's combination of inherent and jet priming actions, greater priming water capacity and ability to prime without racing the engine are valuable advantages.

PUMPS ALL THE WATER A 2" HOSE CAN HANDLE — This Jaeger hi-performance 2" pump delivers its full rated capacity of 10,000 gph when operating at only 2400 to 2550 rpm (as much as 400 rpm below the speeds of similar ordinary pumps). 28" vacuum at the intake flange is not unusual. Weighs only 180 lbs., measures only 24" x 21" x 26" high, as shown. On base, weighs only 160 lbs.

For complete information on Jaeger pumps from 1½" to 10" in size, see your Jaeger distributor or send for Catalog P-4.

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COMPRESSORS • LOADERS • TRUCK MIXERS • CONCRETE MIXERS • PAVING MACHINES

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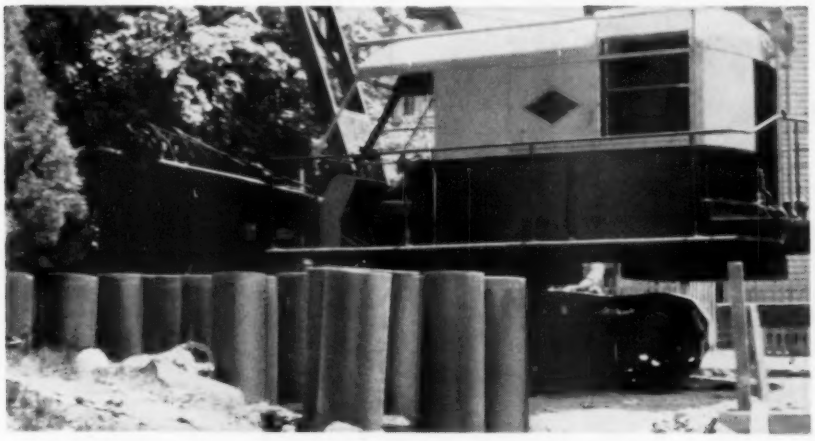
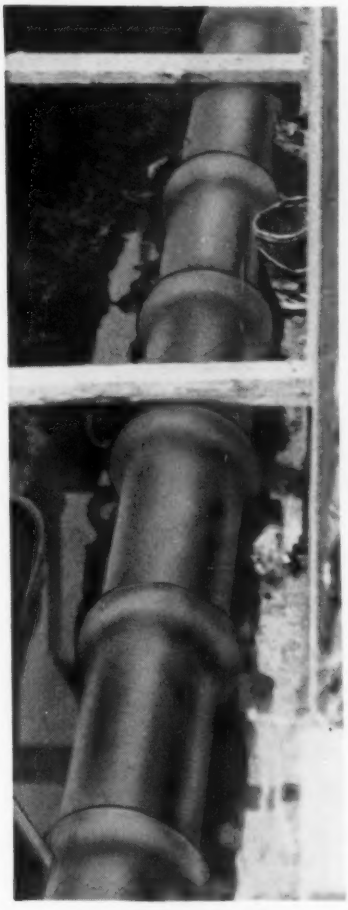
William Donald Hurst is Commissioner of Public Works and Buildings, that is, City Engineer, for Winnipeg, Man.; and Chairman of the Commissioners of Greater Winnipeg Water & Sanitary Districts, of the River and Streams Protection Authority and of the Winnipeg Building Commission. He attended the University of Manitoba and Virginia Polytechnic Institute, getting the degrees of B. Sc. in Civil Engineering and of Civil Engineer in 1930 and 1931. He has been with the City of Winnipeg since 1931. The scope of the work for which he has been responsible is shown by the many important engineering projects that have made Winnipeg one of the foremost cities.

His activities have been as many and as varied as his duties. He has had numerous papers and articles published in engineering journals; he is a member of EIC, AWWA, FSIWA, APWA and the Manitoba Association of Architects and is a registered Professional Engineer in Manitoba and Minnesota. He was a prime factor in the recent formation of a Canadian Chapter of the APWA. He has been active in and honored by many engineering organizations and is a recipient of the Award of the AWWA. He is Chairman, Winnipeg Branch, Engineering Institute of Canada; President of the Association of Professional Engineers of Manitoba; Director of the APWA; and Chairman of Policy Committee of the Winnipeg Symphony Orchestra.

He is married and he and Mrs. Hurst have a daughter 19 and a son 12. His hobbies are philately and wood-working and his recreation is golf. The first Canadian engineer to appear on our cover, we welcome him for his many attainments and delightful personality.

CLAY PIPE PLAYS BIG ROLE IN TRAFFIC ARTERY MODERNIZATION





Today's traffic problems are forcing cities everywhere to rearrange established neighborhoods for construction of new roads, new interchanges, new underpasses. On these vital modernization projects, time and again you find sewers and drains being built of Vitrified Clay Pipe.

The cost of urban modernization runs so high that municipal officials can't afford to take chances on substitute materials. No other material can equal Clay Pipe for corrosion-proof dependability. No other material can match Clay Pipe for never-wear-out permanence. For municipal modernization projects that will benefit the community for generations to come, always specify Vitrified Clay Pipe. *It's guaranteed for a half a century.*

Over 10,500 ft. of Vitrified Clay Pipe in sizes ranging from 8" to 24" is being installed at Worcester, Massachusetts, where a new tunnel is being built to speed the flow of highway traffic through Lincoln Square. The project is under the direction of Resident Engineer Ralph Romano, for the State Department of Public Works. Private contractors include Farina Bros. Co., Superintendent Murray Dash; and Charles Capone Construction Co., Superintendent David Capone.

CLAY PIPE FITTINGS HANDLE ALL YOUR INSTALLATION PROBLEMS

Even in the large trunk-line sizes, there is a **complete** line of Clay Pipe Fittings to help you solve every installation problem. This cut elbow, for example, makes accurate 90° turns possible without using substitute materials or improvised connections.

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BOOKS IN BRIEF

MATERIAL HANDLING REPORT

This illustrated report on the profitable handling of pre-cast concrete for bridges with the use of the RT-150 and YT-40 Hyster lift trucks, has been prepared in the field by Hyster engineers. It is an actual case history of modern labor-saving handling and construction methods in conjunction with these Hyster models. Copies free from your nearest dealer, or from the Hyster Co., P. O. Box 4318, Portland 8, Oregon.

WATER AND BITUMEN-AGGREGATE MIXTURES

Bibliography 17 represents the first comprehensive review and digest of available literature on the effect of water on bitumen-aggregate combinations used in pavements. It was prepared by the HRB Committee on the Deterioration of Bituminous Pavements by the Effect of Water, A. B. Cornthwaite, Chairman. It contains references, appendix and a summary. 45 pages. Price 60¢. Ask for Publication 332. Copies from the Highway Research Board, 2101 Constitution Ave., Washington, D. C.

PRESTRESSED CONCRETE BRIDGES

"Criteria for Prestressed Concrete Bridges" is a publication of the Bureau of Public Roads, 22 pages plus references. It covers design, materials and construction, with the greatest stress—18 pages—on design. It is available from the Government Printing Office, Washington 25, D.C., for 15 cents.

CLEVELAND ANNUAL REPORT

The annual report for 1954-55 for Cleveland, O., is an attractive and well-prepared book of 96 pages. It covers all of the essential functions performed by the city, in simple and understandable terms. Published separately is the report on Cleveland's public utilities, a 32-page report covering the Divisions of Water and Heat, of Light & Power and of Sewage Disposal. These were sent us by Herman Bonchek, Chief of the Bureau of Information, City Hall, Cleveland, O.

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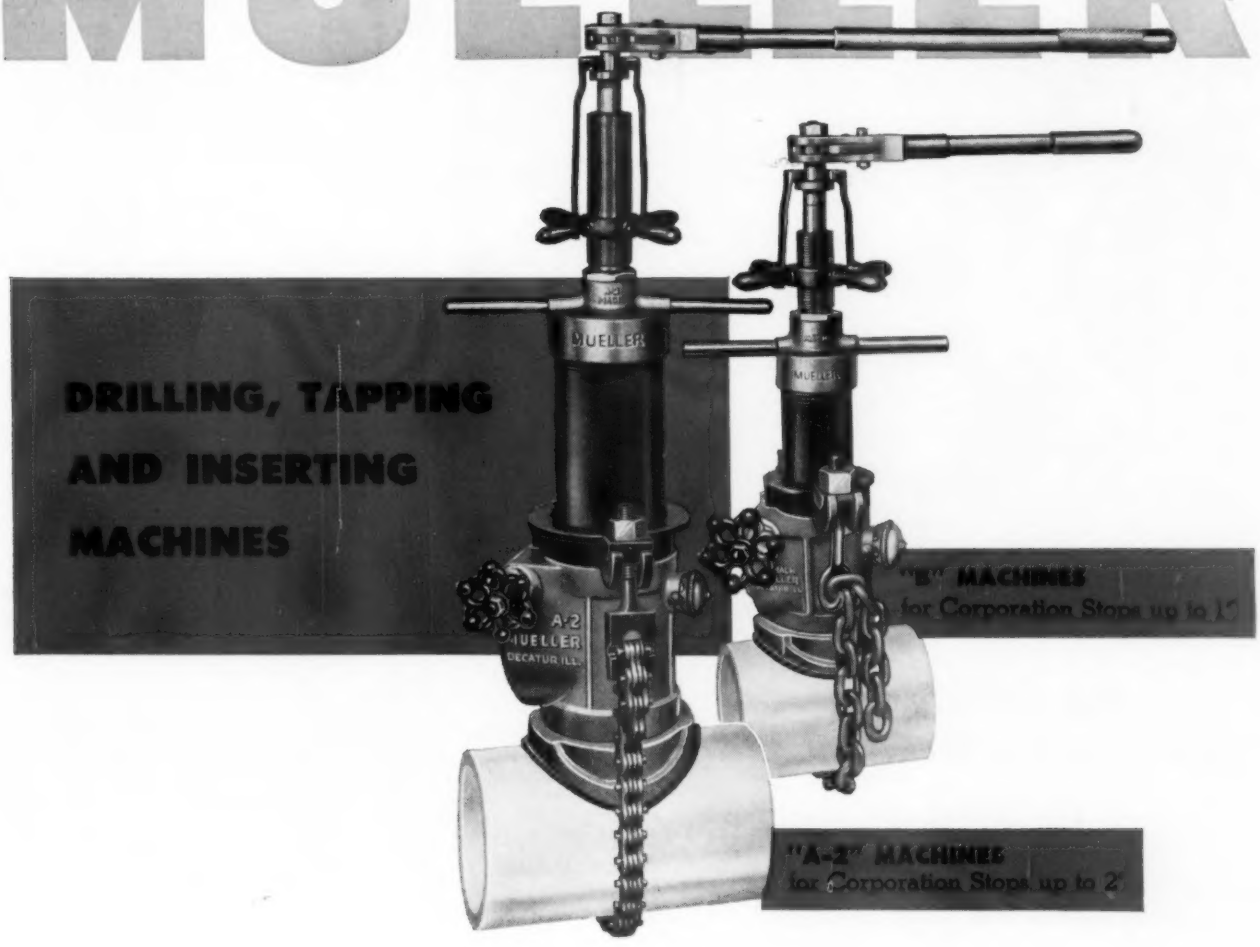

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Mueller "B" and "A-2" Drilling, Tapping and Inserting Machines use a single boring bar to drill and tap the main and insert the Corporation Stop. This guarantees accurate alignment, assures a uniformly tapped hole and eliminates the possibility of cross-threading the Corporation Stop.

A combination shut-off and by-pass valve arrangement in the machine permits the operator to check his progress at any point in the drilling, tapping and inserting operation. The use of this valve advises the operator before the machine is removed if the Corporation Stop is not tight or if the Corporation Stop threads differ from those in the main, or if other trouble exists. This trouble can then be corrected without a shutdown.

Both machines are used under pressure to remove and replace old Corporation Stops, drill, tap and insert new Corporation Stops and insert pipe plugs or to drill and tap dry pipe.

Consult your Mueller Water Works Catalog W-96, your Mueller Representative, or write direct for complete details and specifications on the Mueller "B" and "A-2" Machines.

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When you start to build any structure, many problems arise—interpretation of deed descriptions, computation of areas of irregular plots, dimensioning and location of buildings, laying out circular grades, analysis of contour lines and their manipulation in the solution of grading problems, computation of drainage pipe sizes, etc. This is a handy book for those facing such problems. And, in addition, the first two chapters explain the fundamental principles of logarithms and triginometry for those of us who may be rusty. By Harry Parker and J. W. MacGuire. John Wiley & Sons, Inc., New York; $5.

STATUTES RELATING TO PARKS AND RECREATION

This report, No. 127, contains statutes relating to Parks and Recreation, (with Annotations.) It covers State Parks; Federal Areas; First, Second and Third Class Cities; Municipalities of the Fourth Class; Metropolitan Park Districts, etc. Issued July, 1954, it contains 121 pages. Copies can be obtained from the University of Washington Press, Seattle 5, Wash. The cost is $2.00.

CONTROL OF ATMOSPHERIC POLLUTION

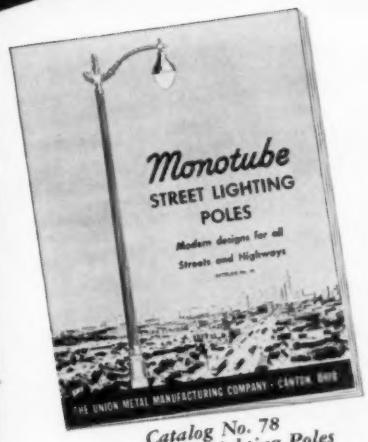
Laws relative to the control of atmospheric pollution are contained in a Manual of the Massachusetts Department of Health, and includes a table, chart and map. 19 pages. Copies free from Division of Sanitary Engineering, Room 511, State House, Boston, Mass.

VERTICAL SAND DRAINS

Bulletin 90 contains two papers presented at the Thirty-Third Annual Meeting of the Highway Research Board—"Checking Up on Vertical Sand Drains," by William S. Housel, and "Hawaii's Experience with Vertical Sand Drains," by K. B. Hirashima. Price 60¢. 37 pages. Copies from Highway Research Board, 2101 Constitution Ave., Washington, D. C.

PHOENIX, ARIZ., TWO YEARS OF PROGRESS

"Your City in Action" is the title of the annual report of Phoenix, Ariz., for the biennium ending June 30, 1954. In 24 pages and cover, the activities and developments are summarized and the administrative staff and service directory are listed. Ray W. Wilson, City Manager.



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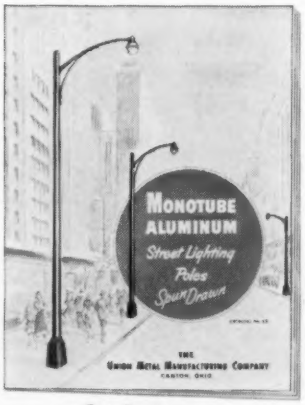

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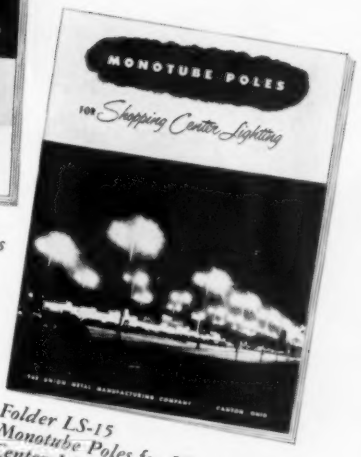

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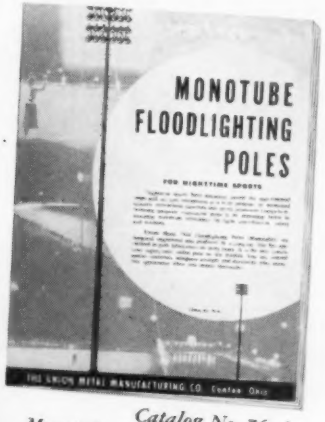

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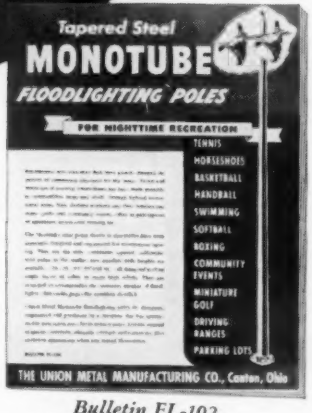

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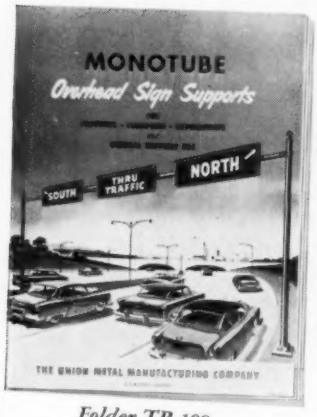

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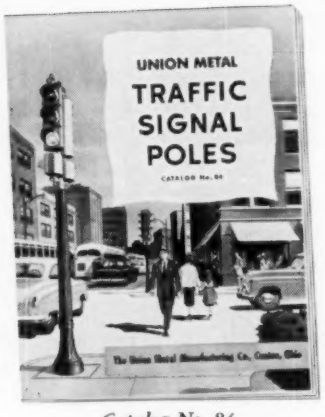

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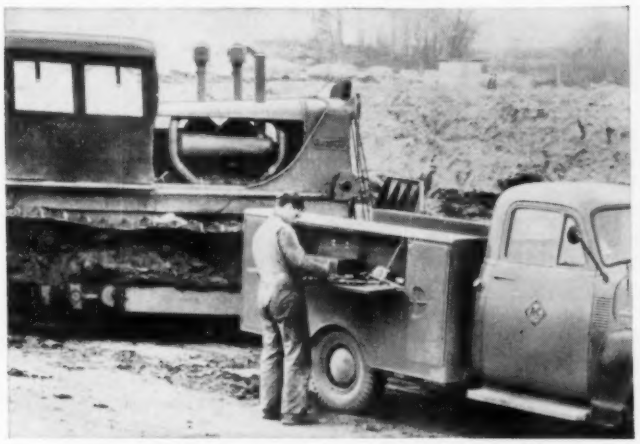
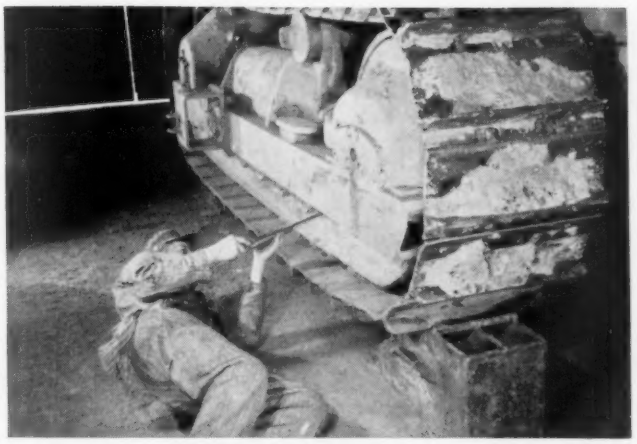
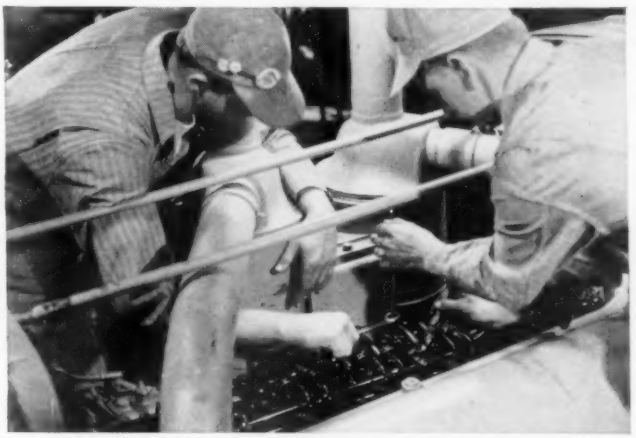


FAST PARTS SERVICE — Factory-built Allis-Chalmers parts are stocked in quantities by the *dealer,* to give you parts service as close to your job as posible. And remember, experienced equipment men agree it pays to use only standard factory-built parts.

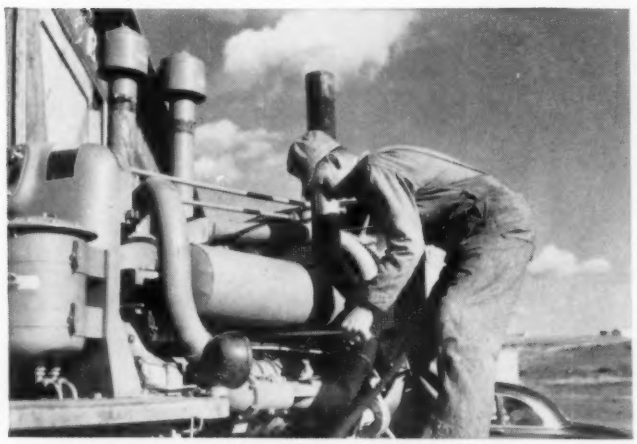


SCHEDULED CHECKUP PROGRAM — Your Allis-Chalmers dealer will help you plan a schedule for all maintenance to keep your equipment operating efficiently. You'll save on repair bills, avoid costly downtime, get far better performance, longer life from your machines.

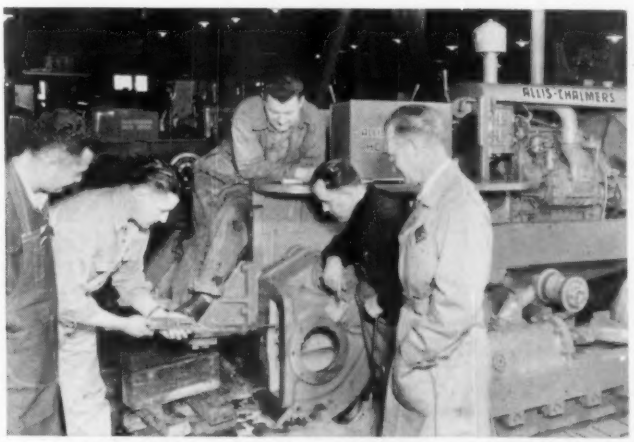
OPERATING TIPS — Allis-Chalmers dealer servicemen are trained to give your operators all the facts they need to operate your equipment most productively. For example, one of the most important things for an operator to know — how to recognize when adjustments should be made.



SPECIALIZED FACILITIES at your Allis-Chalmers dealer include factory-approved tools and all necessary service equipment. Factory-approved methods are used to save you time and money, assure finest workmanship, to help you get full value for your equipment dollar.



FACTORY-TRAINED DEALER SERVICEMEN have the specialized experience to help you spot trouble symptoms fast, help you prevent costly breakdowns. Their training never stops; they make it a *policy* to stay abreast of every development so they can be of real value to you. And they're ready to go when and where they're needed.



FACTORY SERVICE SCHOOL TRAINING is open to your servicemen just as it is for dealers. Training is by men who know the equipment best. Visual aids and easily understood literature are used. And your men discover that Allis-Chalmers design simplicity makes the equipment easy to learn . . . easiest of all to service.

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FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

How to End Hard Water Troubles

106. Permutit water softeners are described in a well illustrated, 20-page booklet which describes the principles of operation, design features, advantages and specifications of zeolite (cation exchange) water softeners. Both automatic and manually-controlled units are described. To get a copy of this helpful publication. Bulletin 2386A, write The Permutit Co., 330 West 42nd St., New York 36, N. Y. or check the coupon.

Design Data on Short Body Cast Iron Fittings

107. Detailed standard specifications for Warren Short Body pressure fittings are provided in a convenient booklet issued by Warren Foundry & Pipe Corp., 55 Liberty St., New York 3, N. Y. The compact short body design is both light and economical and is particularly well adapted for water distribution systems in city streets or congested areas. Check the coupon for your copy.

Convenient Source of Rubber for Road Improvement

128. "Surfa-Seal" Pellets, made in the form of small cubes containing 40% rubber hydrocarbons are now available for improving asphalt stability, providing low temperature flexibility and reducing hardening and stripping. A booklet which covers these advantages in detail and tells how the pellets are used and quantities required is offered by Naugatuck Chemical Div., U. S. Rubber Co., New York 20, N. Y. Just check the handy coupon.

Modern Lighting for Sports Events

133. Helpful engineering data on standardized "Sportslighting" are provided in a comprehensive 56-page manual issued by Westinghouse Electric Corp., Lighting Div., Cleveland, Ohio. Floodlight layouts and floodlighting equipment are shown for baseball, football and softball fields, tennis courts, golf driving ranges and many other outdoor and indoor sports activities. Application suggestions show how lights may be mounted and wired for best results. Get this authoritative booklet, No. B-5872, by checking the coupon.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y. Check the coupon for your copy.

"Float-Treat" Process For Industrial Wastes

333. The Rex "Float-Treat" process, a system used to separate greases, chemical flocs and suspended organic matter from industrial waste liquids, is the subject of a new booklet issued by Chain Belt Co., Milwaukee 1, Wis. Detailed description includes plan views, diagrams, photos and text. Get Bulletin 54-82 by checking the coupon.

Dependable Standby Power For Water Pumping

342. The use of LeRoi generator sets for dependable low-cost standby power is discussed in an attractive bulletin, No. G-6, issued by LeRoi Company, Milwaukee 14, Wis. Detailed specifications are included. Check the coupon for your copy.

Check List for Successful Earthmoving Bids

147. Valuable information for the earthmoving contractor and for the engineer who must estimate earthmoving costs is provided in a new two-color illustrated booklet issued by Caterpillar Tractor Co., Peoria, Ill. A convenient check list is included to help select the proper equipment for the job. Check the coupon to get Form No. DE502.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the coupon or write to the manufacturer and ask for Bulletin TR-94A.

Get Data On Magnesium Anodes For Corrosion Protection

161. The use of magnesium anodes to protect pipe lines and other structures from the corrosive effects of aggressive soils is discussed in the bulletin "Plug Corrosion Leaks" issued by Pipe Line Anode Corp., Tulsa, Okla. To get this interesting literature, prepared by anode specialists, just check the coupon.

Data on Builders Butterfly Valves

172. Information on the newly expanded line of tight-closing, rubber-seated butterfly valves made by Builders-Providence, Inc., 345 Harris Ave., Providence, R. I. is available in Bulletin 650-LI. General arrangement dimension prints and data on valve operators are included. Check the coupon for your copy.

MORE LISTINGS ON PAGES 34 TO 52

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 140 from Norton Co., Worcester 6, Mass. by checking the coupon.

Couple Pumps and Where to Use Them

194. Turbine pumps, coupled to motors or gear drives, offer many arrangements to suit your pumping needs. Mechanical features, capacity curves and service applications are reviewed in Bulletin C of Layne & Bowler Pump Co., Box 6991, Los Angeles 22, Calif. Check the coupon for your copy.

Powerful Mist Sprayer Controls Pests

241. Mist sprayers for shade tree and mosquito control, roadside weed control sprayers and a full line of pressure pumps, engine equipment and spray guns in assemblies for every spraying need are presented in an illustrated catalog by Hardie Mfg. Co., Hudson, Mich. Get 40-page Catalog No. PC 57 for data on all types of chemical spray and dust equipment. Check the coupon.

2-55

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

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Booklets from pages 32 to 52:

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New Products, pages 154 to 159:

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2-8 2-9 2-10 2-11 2-12 2-13 2-14
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Oliver "OC-12" with hydraulic 1-yd. loader. This model has the long track frame for added stability. Loader has exceptional bucket rotation and 10' 4" loading height.

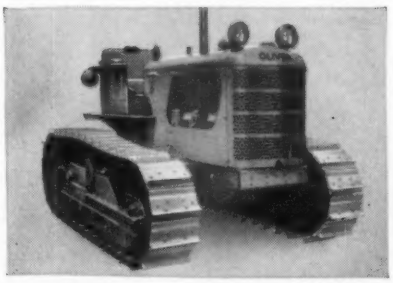
Another great tractor by Oliver ...THE POWERFUL "OC-12" CRAWLER!

It's a rugged, eager worker in the 45 drawbar h.p. class that features advancements in power, economy and operating ease to make every job more profitable.

The "OC-12" offers two engines of exceptional torque span—diesel or gasoline. Both engines have instant electric starting, pressure cooling, by-pass thermostat and full-flow oil system to insure quick starting and long, low-cost service.

The smooth lines of this unit show it is made for easy access and operator visibility. Controls are right where they're the handiest. Down to the key-lock switch, foam rubber seat, overhead-linkage clutch, this tractor caters to operator convenience.

Your Oliver Industrial Distributor will be glad to demonstrate the "OC-12." Give him a call.



The "OC-12" is available in two track widths: 44- and 60-inch—and two track lengths, one with four lower track wheels and one with five. Standard grousers are 14-inch.

Here is the "OC-12" with hydraulic bulldozer. Hydraulic pump is front mounted. Special protective grille is part of 'dozer frame. Blade has provision for tilt adjustment.

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on all types of chemical spray and dust equipment. Check the coupon.

To order these helpful booklets check the coupon on page 32.

NEW LISTINGS (cont.)

Design Data For Wet Pit Pumps

373. Two Types of vertical, centrifugal wet-pit pumps, a heavy duty bilge pump for handling solids-free liquids and a screenless sewage ejector are described in Bulletin 3-8001 of Yeomans Brothers Co., 1999 N. Ruby St., Melrose Park, Ill. Pump and motor selection tables, typical layouts for drainage sumps and municipal booster stations, and other helpful engineering data are included in this 24-page bulletin. Check the coupon for a copy.

How to Clean and Develop Water Wells

375. The use of Weltone, which combines the cleaning power of Calgon with disinfecting and other chemicals in a safe, highly soluble powder is described in an interesting and informative booklet. For your copy of this descriptive literature write Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. or check the coupon.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing. Check the coupon for this interesting literature.

Helpful Bulletins Give Sludge Pump Details

318. "Scru-Peller" sludge pumps for handling thick primary sludge, cutting up all solids as they pass through the pump, described with illustrations of details in a 20-page Bulletin 190B. Standard non-clog pumps are described in Bulletins 126E and 127D. Get them from Chicago Pump Co., Dept. J, 622 Diversey Pkwy, Chicago 14, Ill., by checking the coupon.

Explaining the Water Diaphragm Principle of Chlorinator Operation

243. The features, operation and benefits of the water diaphragm principle of chlorinator operation are fully described and illustrated in Publication TA-1026-C-1 recently published by Wallace & Tiernan Inc., Belleville 9, N. J. This helpful publication is yours for merely checking the coupon.

Convenient Data on Traffic Signs and Markers

126. A complete line of traffic control devices, including stop signs, warning signs, regulatory signs and danger signals is presented in the fully-illustrated catalog of the Grote Mfg. Co., Bellevue, Ky. Helpful excerpts from the "Manual on Uniform Traffic Control Devices for Streets and Highways" are included. Get a copy by checking the coupon.

Data On Efficient Mechanical Pipe Joints

396. "Bolite" standardized mechanical joint pipe lays fast, joints are quickly made, are flexible and durable. For full details on this equipment write McWane Cast Iron Pipe Co., Birmingham, Ala., or check the coupon.

Cleaning and Relining Water Pipe the Easy Way

397. Complete facilities for relining cast iron or steel water pipe lines from 4" to 144" in diameter, with both the Tate process and the Centriline process, offered by Pipe Linings, Inc., 4625 Firestone Blvd., Los Angeles, Calif. For full information on cleaning and relining pipe with only momentary interruption of service, check the coupon.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal; and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tourneau-Westinghouse Co., Peoria, Ill., or check the coupon.

Advanced Tractor Design Gives Better Performance

399. For greater power, performance and economy, Ford Tractor offers 4-wheel stability, built-in hydraulic system and power take-off among the many new features. A complete booklet describes five models in two power series, showing the latest in advanced tractor design. For your copy check the coupon or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

●

WATER WORKS

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Graver Reactivator Package Water Treatment Plant

58. Specially designed "package" plants for treating up to 2 MGD are described in literature of the Graver Water Conditioning Co., 216 W. 14th St., New York, N. Y. All necessary components are contained, including chemical feeders, Reactivators, filters, piping, valves, controllers and accessories. For full data check the coupon or write to the manufacturer.

Need more facts about advertised products? Mail your Readers' Service card now.

To order these helpful booklets check the coupon on page 32.

New Bulletin Introduces Dorrco Aldrich PeriFilter System

21. By combining a pre-treatment mechanism and an annular rapid sand filter in a single unit, the Dorrco Aldrich PeriFilter system offers a substantial reduction of initial installation costs and permits unusual design flexibility for treatment of municipal and industrial water supplies. For details on the system, including instrumentation and operation get Bulletin No. 9042 by writing Dorr-Oliver, Inc., Barry Pl., Stamford, Conn., or check the coupon.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, is available from Reed Mfg. Co., Erie, Pa. Check the coupon.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Useful Data on Butterfly Valves

100 Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves are contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., Eliot Street, Fairfield Conn.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2¼" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves. Check the coupon for this useful information.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5419, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5528 Vineland Blvd., No. Hollywood, Calif., by using the coupon.

Reference Catalog for Valves, Fittings and Hydrants

125. Complete data on gate valves for all services, operating accessories, check valves, fire hydrants and related specialties plus a reference section of useful engineering data is contained in Catalog H-1 issued by Rensselaer Valve Co., Troy, N. Y. All engineers who specify valves, fittings, and hydrants should have this valuable catalog for ready reference. Check the coupon.

BITUMULS® assures high-quality in-place mixes

WHEN you're working with native or in-place material and you get a thoroughly-coated mix like this rolling off the blade, it's no accident. There's a reason for it, and that reason is *Research*.

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Today, we maintain the most extensive research program in the industry. Over the years have come such developments as Bitumuls for use with "hard-to-coat" native aggregates; Bitumuls for use with damp or wet aggregates; Bitumuls for use in damp or inclement weather. Each new development has been designed to assure fast and thorough coating of aggregates to produce a high-quality mix with uniform drying characteristics.

Bitumuls—emulsified asphalt for cold-application—is available in Mixing Grades as well as in grades designed for Surface Treatment and Penetration work. Full technical information on all grades is available from Bitumuls Engineers who work out of offices from coast to coast. In addition, illustrated booklets containing data on Bitumuls application are available without obligation.

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To order these helpful booklets check the coupon on page 32.

Pollution-Proof Outdoor Drinking Fountain

144. An outdoor drinking fountain so designed that contamination by cross connections or back siphonage is not possible is fully described in a 4-page bulletin. Features neat appearance, easy installation. Write Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio, or use coupon.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000-000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the coupon to get your copy.

Heavy-Duty Pipe Cutter Works In or Out of Trench

164. Built to stand the most severe service, the all-purpose Ellis & Ford pipe cutter, for cast iron water mains 4" through 12", is easy to use in tight places, works in or out of trench. Full details on cutter and interchangeable parts in Catalog 37, available by checking coupon. Ellis & Ford Mfg. Co., Ferndale 20, Mich.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the coupon.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the coupon or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

What You Should Know About The Centriline Process

197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered. Check coupon for your copy.

Cleaning Service for Every Type of Pipe Line

302. Flexible Pipe Cleaning Co., operating with specialized equipment and trained crews, is prepared to remove scale, rust and other deposits from pipes for every type of service. For details and estimates furnished without obligation write Flexible Pipe Cleaning Co., Box 167, Los Nietos, Calif. or check the coupon.

Data Offered on Elevated Steel Tanks

166. Attractive designs for elevated steel water storage tanks are shown in bulletins of R. D. Cole Mfg. Co., Newnan, Georgia. For copies of latest Cole literature check the handy coupon

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 225 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the coupon for your copy of this helpful bulletin.

Reduce Valve Operating Work —Investigate the Flowtrol

353. The Golden-Anderson Flowtrol valve, designed to replace troublesome globe, angle, plug or gate valves that require frequent manual operation is described in 8-page technical bulletin W8-A of Golden-Anderson Valve Specialty Co., 1244 Ridge Ave., Pittsburgh 83, Pa. Available in 2" to 36" sizes. Check coupon for full data.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif. Get latest data by checking the coupon.

Helpful Data on Swimming Pools

364. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., Michigan City, Ind. Check coupon for your copy.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the coupon.

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The new Littleford "Trail-O-Patcher"—the first self-contained, all-weather bituminous mixer—gives highway departments and contractors a real break. The 200-gallon asphalt tank holds enough to last all day. And this ingenious new mixer has its own bitumen metering system and its own aggregate drying compartment.

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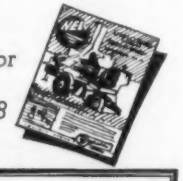

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Complete Booklet on Pipe Line Equipment

246. Equipment for all types of jointing, maintenance and repair jobs on water, gas and sewer lines is described and illustrated in Catalog No. 25 issued by Joseph G. Pollard Co., New Hyde Park, N. Y. Leak detectors, pipe finders, melting kettles, cleaning tools, and a full line of hand tools for water and sewer departments, and many other items are included. Be sure to get your copy now. Just check the coupon.

Manual Covers All Types Of Pipe and Service Repairs

266. Full details on the entire line of Skinner-Seal pipe repair clamps, service fittings and drilling equipment are presented in a new catalog and service manual offered by the M. B. Skinner Co., South Bend, Ind. Step-by-step installation pictures and captions give clear, concise instructions for the repair of all types of pipe leaks. Get helpful Catalog GW by checking the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Instrumentation and Control Equipment For Water and Sewage Plants

298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check coupon for your copy.

Boltless Tapping Sleeves Speed Installations

370. Boltless tapping sleeves for cast iron and asbestos-cement pipe offer top economy by eliminating caulking, cutting down excavation and speeding up installations. Be sure to investigate this new product. Write Corey Mfg. Co., 3279 Verdugo Rd., Los Angeles 65, Calif., or check the coupon.

Automatic Proportioning Unit For F&P Chlorinator

376. Automatic adjustment of chlorine feed to proportion of main line flow rate is accomplished by the Fischer & Porter Automatic Proportioner, described and illustrated in Catalog 70-20 of Fischer & Porter Co., Hatboro, Pa. Available by checking the coupon.

Automatic Cutter Saws Cast Iron Pipe

393. This portable automatic pipe saw, available with either pneumatic or electric drive, makes fast precision cuts in 8-in. to 60-in. cast iron or steel pipe. Features are light weight, minimum clearance required, easy operation even when submerged. Get details from Prescott Tool Co., Inc., Worcester, Mass., by checking the coupon.

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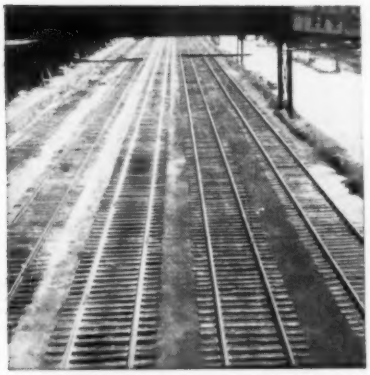
SEWERAGE AND WASTE TREATMENT

Modern Methods and Materials For Joining Sewer Pipe

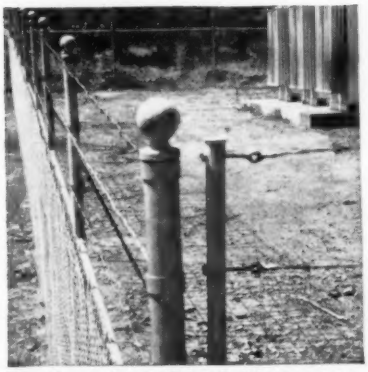
227. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading. Get a copy by checking the coupon.

Weed and Brush Control lasts longer with Du Pont TELVAR® and AMMATE®

Weed Killers **Weed and Brush Killer**



"Telvar" has kept this yard clean of vegetation for two years.



Note thorough job "Telvar" did around this fence. "Telvar" won't corrode fence or equipment; it's non-flammable, non-volatile.

Heavy weed growth around pole was controlled with one application of "Telvar." It's easily applied and extremely low in toxicity to humans and animals.

One application of "Telvar" solves weed problems for a season or longer!

"Telvar" kills through the roots . . . prevents regrowth. Low dosages (20 to 80 lbs. per acre) make it cost little for the results you obtain. Low rates also mean less handling, less storage facilities. If you're looking for a way to cut maintenance costs to new low levels, include "Telvar" in your weed-control program. Available in two formulations: "Telvar" W; and "Telvar" DW, which is especially suited for light, sandy soils and in areas where annual rainfall is higher than 20 inches.

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers!

When the original spray job is well done, brush is kept under control with nothing more than an occasional spot spray later. You can rely on "Ammate" to do the job safely, even where your rights-of-way adjoin crop land, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D 4038, Wilmington, Del. In Canada—Du Pont Company of Canada Limited, Montreal, Box 660, Canada.

TELVAR® Weed Killers **AMMATE®** Weed and Brush Killer

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"Ammate," applied five years ago, is still keeping brush down along this right-of-way.

Maintenance crews prefer "Ammate" because they can use it without hazard to themselves, livestock, wildlife or adjoining crops.

Same right-of-way as above, three years after treatment. Brush still under control; low-growing cover returned to resist erosion.

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What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Design Data Offered On The Spiragester

42. The Spiragester, a unit which combines the Spiraflo Clarifier and a digestion compartment in a two-level arrangement to save space and reduce construction costs, is fully described in Bulletin 124 released by Lakeside Engineering Corp., 222 West Adams, Chicago, Ill. Design details, including capacities for 8' to 24' units are furnished together with typical plan and elevation. Check the coupon for this helpful bulletin.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletins for engineering data, diagrams of typical installations and details of component parts. Check the coupon or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 550, Coraopolis, Pa. Check the coupon for your copy.

Helpful Data on Bermico Pipe Fittings

280. Data are now available on fittings for use with Bermico sewer pipe and perforated pipe—T's, Y's and bends to make complete root-proof, water tight, corrosion-resistant Bermico pipe systems. Get full information by checking the coupon. Brown Co., 150 Causeway St., Boston, Mass.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Blower Selection Data Aids Sewage Plant Design

274. Characteristic curves for blower operation with constant-speed, multi-speed and variable speed motors; details of several types of blowers; data on accessories; and a discussion of advantages of positive displacement rotary blowers are provided in Bulletin RB-154 of Roots-Connersville Blower Div., Connersville, Ind. Get this helpful bulletin by checking the coupon.

Data Offered on Water, Sewage and Waste Treatment Equipment

263. Equipment for sewage treatment, water purification and industrial waste treatment is described in a 16-page Book No. 2440, published by Link-Belt Co., Colmar, Pa. Case histories, photographs and schematic drawings are included. Straightline and Circuline collectors, Thru-Clean and Straightline bar screens, Tritor screens, flash mixers, scum breakers and other units are described. Check the coupon for your copy.

Here's Help for Laboratory Planning

369. A comprehensive laboratory planning guide that tells the engineer and designer how to obtain maximum space economy; utilize new and present facilities; and use functional design in locating utilities, ventilation and lighting is now available from Metalab Equipment Corp., Hicksville, L. I., N. Y. Complete data includes sectional and interchangeable lab equipment, furniture and accessories. Check the coupon for this valuable planning aid.

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Now for the first time, Rensselaer Hydrants as well as valves are available with Ring-Tite Joints.

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This feature will speed up hydrant installations and provide tight, flexible joints.

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Rennselaer Fire Hydrants 4" and 5" with Ring-Tite Bells can be connected to 4" and 6" and 8" Transite Pipes. Lugs are provided to tie the Hydrant to the pipe line.

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The Rensselaer Hydrant has been preferred by superintendents, fire chiefs and maintenance men for more than half a century.

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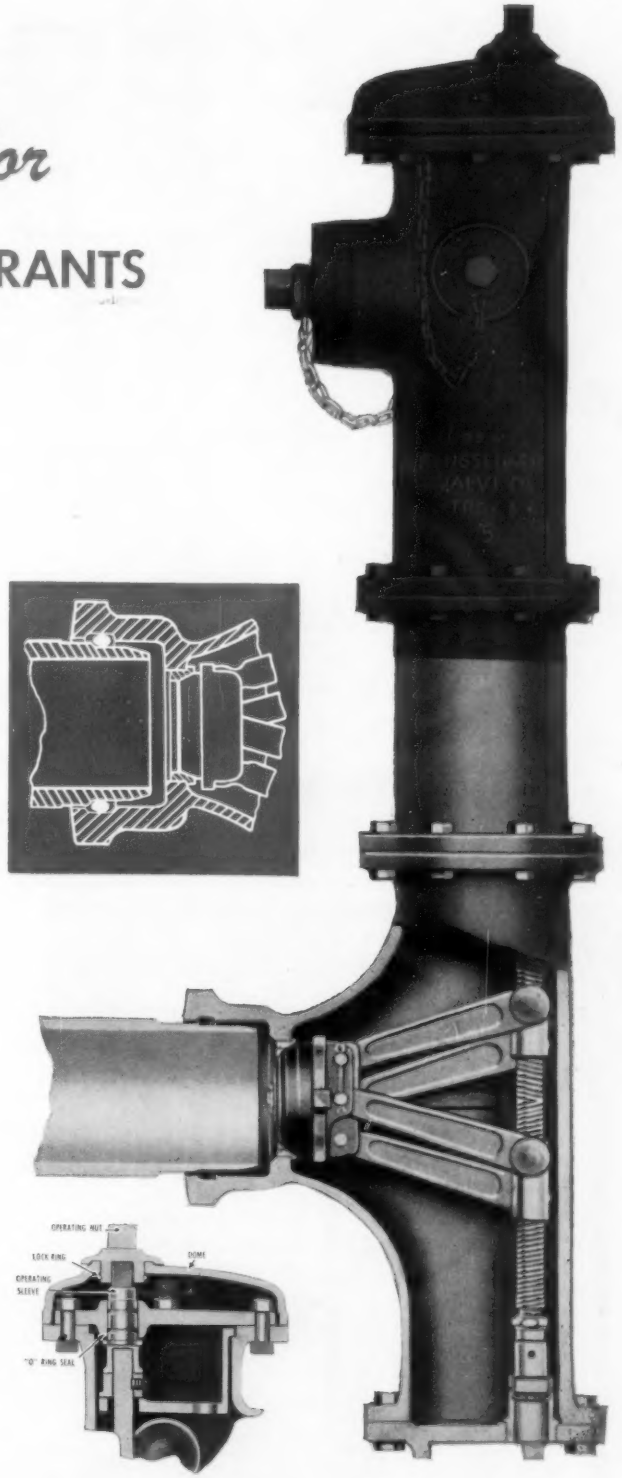

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CONSTRUCTION EQUIPMENT AND MATERIALS

Handbook Covers All Soil Test Apparatus

24. Over 800 items of apparatus for engineering tests of soils, concrete and bituminous materials are described and illustrated in a new 72-page catalog published by Soiltest, Inc., 4520 W. North Ave., Chicago 39, Ill. All standard apparatus for field and laboratory engineering tests of soils are included. Get Catalog 53 by checking the coupon.

Small Tractor Has Countless Uses

63. The "Agricat" tractor provides a small, powerful unit that can be used on lots of jobs. Tight spots are no obstacle. Attachments for dozing, snow plowing, loading. Full data available from Earl H. Pence & Co., Inc., 2150 Washington Ave., San Leandro, Calif. Check the coupon today.

What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the coupon today.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Useful Attachments for "Payloader" Tractor Shovels

95. Increased versatility for Hough "Payloader" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade show plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc. Check the coupon today and full details will be sent.

Helpful Manual on Bodies and Hoists

101. The Heil Body and Hoist Manual is a handy 68-page booklet designed to furnish all information needed for selection of the correct body and hoist unit for your needs. Body and hoist features, payload distribution, hoist capacities and full operating and maintenance instruction are a few of the items covered in this comprehensive manual. Check coupon or write The Heil Co., Milwaukee, Wis.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection, and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Lightweight Drill Aids Soil Sampling

228. Two Acker core drills, models LD and LLD, are described in Bulletin No. 21 recently made available by the Acker Drill Co., 725 W. Lackawanna Ave., Scranton, Pa. Used for cutting highway test cores, soil samples, drainage holes and for foundation test drilling, these machines are designed for fast and economical operation. Get the details by checking the coupon.

Auxiliary Equipment For Use with the "Jeep"

326. Be sure to investigate the versatile "Jeep" as a source of auxiliary power in combination with convenient transportation. Power take-off operates air compressors, generators, other equipment. For details write to Willys Motors, Inc., Toledo 1, Ohio, or check the coupon.

(Continued on page 48)

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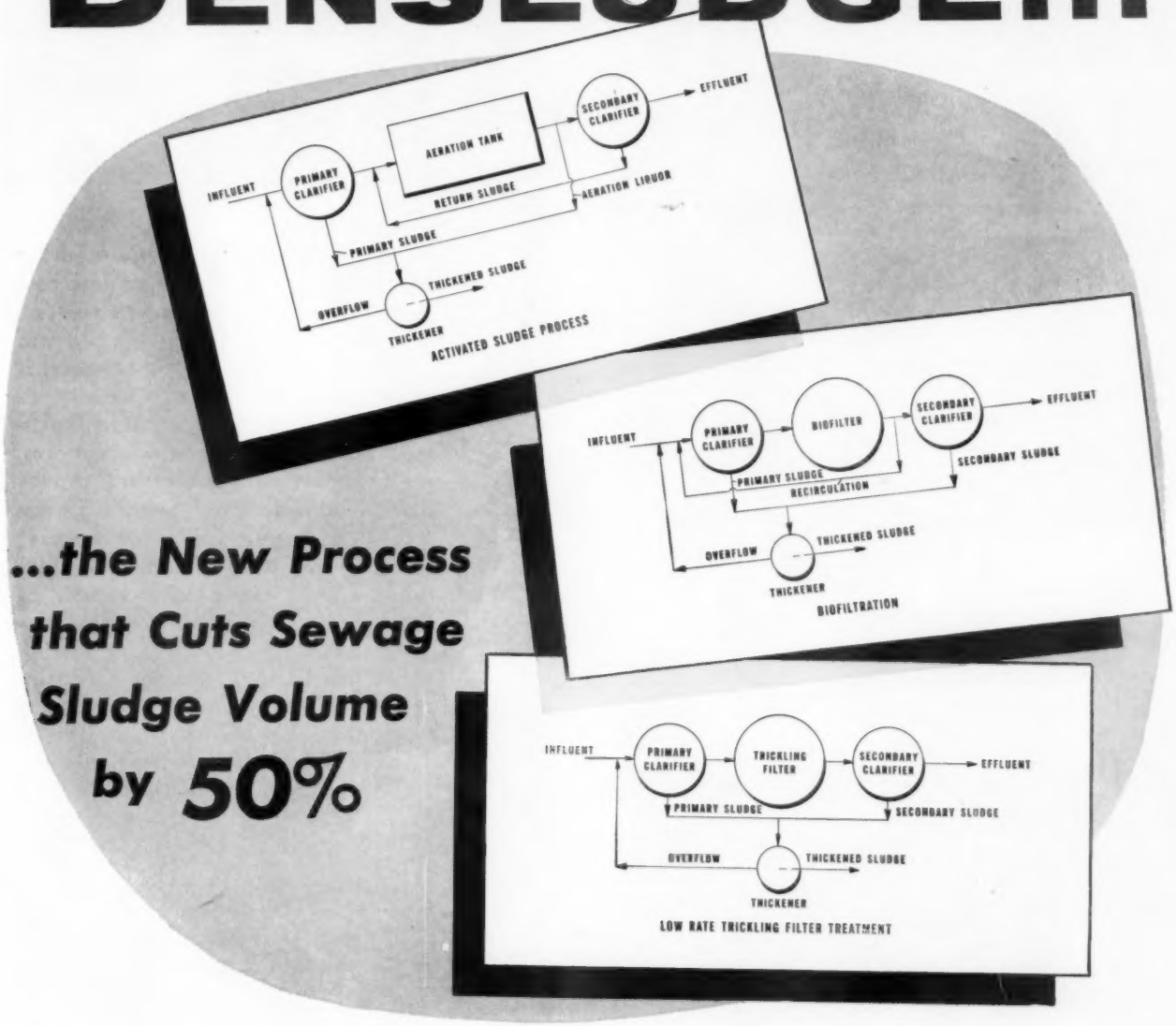

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Bulletin #6260 describes how the process works, gives average operating results on three types of sewage sludge and covers the Dorr Densludge Thickener—the equipment key to the process. We'd like to send you a copy — without obligation, of course.

Write to Dorr-Oliver Inc., Stamford, Conn., or in Canada, 26 St. Clair Avenue East, Toronto 5.

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Where installations are planned for long-term service to assure low cost per service year, engineers rely on cast iron pipe as a dependable and adaptable material. Consequently, it is specified for a wide variety of applications, both utility and industrial, including water supply, gas, sewerage, fire protection, power plants, oil refineries, process industries and many forms of special construction. Long life and low maintenance cost are *proved* results of the high beam-strength, compressive-strength, shock-strength and effective resistance to corrosion of cast iron pipe. For information write: Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3, Ill.

(above)
Laying 16-inch cast iron pipe alongside railroad tracks at Ft. Lauderdale, Florida.

(at right)
Cast iron pipe being installed for large process industry plant in Chicago.

CAST IRON PIPE

To order these helpful booklets check the coupon on page 32.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

Service Bodies to Suit Your Maintenance Needs

260. Service bodies, tailored to fit the needs of any municipal department and featuring many outstanding features of construction and design, are described in literature of Morrison Steel Products, Inc., 601 Amherst St., Buffalo 7, N. Y. The new line has models to fit all popular truck chasses; ½ to 1½-ton; single or dual wheel. Be sure to check the 18 different compartment arrangements offered —there is one that is best for the convenience and efficiency of your maintenance crews. Use the handy coupon today.

What Equipment is Needed By Modern Community Services?

328. The importance of modern equipment in work programs is graphically illustrated in the 16-page booklet "Allis-Chalmers Offers New Economy for Villages, Townships, Counties, Cities, States, Federal." Action photographs span the range of community projects and illustrate tractors, scrapers, graders, power units and their multi-purpose attachments. Get this handsome booklet and review your needs today. Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee 1, Wis. Check the coupon.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication. Check the coupon for your copy.

●

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Get Full Data On Aggregate Spreaders

286. Accurate control for spreading crushed rock, chips, sand or ice control materials is featured by all models of Highway Equipment Co. materials spreaders. Data on both trailer and tailboard types available by checking the coupon. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

●

AIR POLLUTION CONTROL

Reliable Estimates of Smoke Density

160. The Smokescope, product of Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa., offers a reliable method for estimating smoke density. This data is the first requirement of an effective program for air pollution control. Find out how easy it is to take smoke density readings. Check the coupon for Smokescope data.

●

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The lastest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the coupon. American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 4, Calif.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Uniform Salt and Cinder Spreading at All Speeds

93. Be sure to investigate the hydraulically operated ground drive offered by Baughman to give you the advantages of two drive speeds and uniform distribution of material regardless of truck speed, but without the need for power takeoff or transmission. Full data on this and many other features in Form A-380. Baughman Mfg. Co., Jerseyville, Ill.

Examine a Tractor Piece by Piece

99. The 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-2 Diesel is considered separately. These piece by piece discussions are supplemented by notes on easy servicing, versatile applications and attachments for every need. Get your copy of form CR-313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

Tests Invited on This Durable Crosswalk Marking

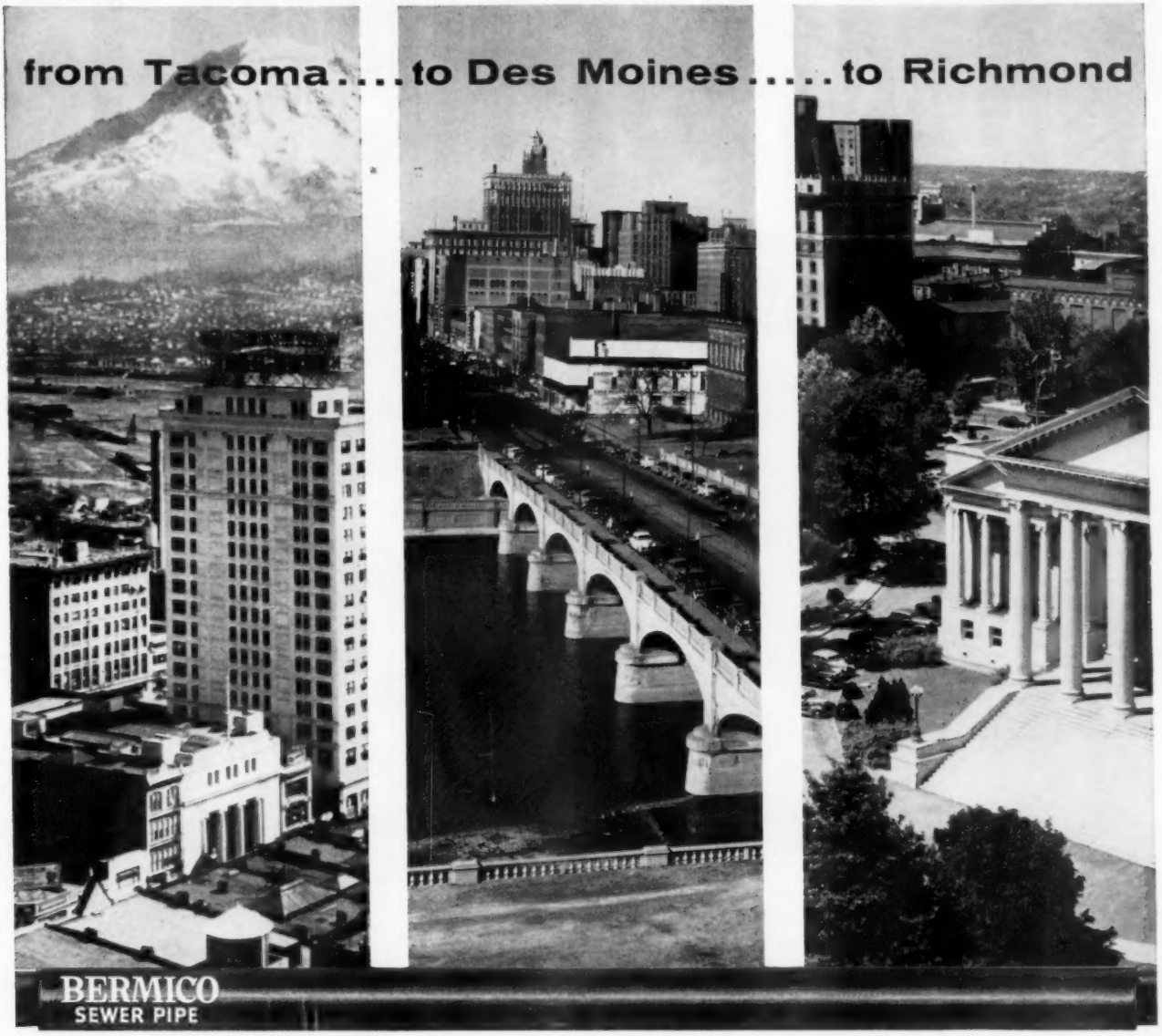
294. Crosswalk markings of Veon, the instant setting line that is easily applied, trouble-free and economical is described in literature of the Veon Chemical Corp., 22-09 Bridge Plaza, North, Long Island City 1, N. Y. Available in white, red or yellow. Tests under your local conditions are invited. Get details by checking the coupon.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Layfette, Ind. or use the coupon.

Versatile Road Wideners Improve Highways at Low Cost

374. In illustrated bulletins describing Apsco road wideners and base pavers you will find full data on two versatile pieces of road-building equipment that will help you hold down costs while bringing old roads up to present day standards. Get the full story today by checking the coupon or write to Blaw-Knox Equipment Div., Blaw-Knox Co., Pittsburgh, 38, Pa.



ASK THE CITIES* THAT USE IT!

Learn why BERMICO® LIFETIME PIPE is going into more plumbing codes than ever before

From coast-to-coast in cities and towns everywhere, more and more sanitary engineers are specifying BERMICO—for *three* main reasons:

1. ECONOMY—*First* cost is *last* cost with BERMICO—yet you can't buy a *lower*-cost root-proof pipe installed for sewer lines and drainage.

2. DURABILITY—Made of tough wood fibre impregnated with pitch, BERMICO protects against root penetration when properly installed, is corrosion-proof, installs faster and easier—lasts a lifetime.

3. PROVEN DEPENDABILITY—Today, millions of feet of BERMICO are efficiently serving America's communities. Be sure that *your* community is permitted to take advantage of this low-cost lifetime bituminized-fibre pipe. Accept BERMICO—and keep it—in your plumbing code.

For further information write to Dept. BE-2, our Boston office.

*Complete list on request.

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To order these helpful booklets check the coupon on page 32.

Cut Road Building Costs With A Tamping-Leveling-Finisher

175. For a full description of roadbuilding methods with a tamping-leveling-finisher which lays a smooth mat without forms, tamping and compacting to desired grade, get Bulletin 879-A from Barber-Greene Co., Aurora, Ill. Check the coupon today.

How To Build Stabilized Heavy Traffic Pavements

233. A 16-page booklet published by Seaman Motors, Inc., Milwaukee, Wis., shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worth-while booklet for every highway engineer. Check coupon for copy.

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Greenlee Bros. & Co., Rockford, Ill.

●

REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check coupon or write Gar Wood Industries, Inc., Wayne, Mich.

Efficient Landfill Operations For Small Communities

349. Step-by-step photos and concise text are used in a bulletin of the Oliver Corp., to show the construction and operation of a sanitary landfill, using equipment especially suitable for the smaller community, the Oliver OC-3 Tractor-Loader. Besides providing economical refuse disposal, many other jobs handled by this unit are suggested. For a copy, write to the Oliver Corp., 400 W. Madison St., Chicago 6, Ill. or check the coupon.

●

CIVIL DEFENSE

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP-31 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 30 Kw, portable and stationary, are described. Write the Kohler Co., Kohler, Wis., or use the coupon.

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., So. La Salle St., Chicago 3, Ill.

●

WEED CONTROL

Weed Killing Case Histories

205. Weed and grass control lasts longer . . . costs less with Du Pont "Telvar" weed killers. Interesting folder published by Grasselli Chemicals Dept., E. I. Du Pont de Nemours & Co., Inc., Wilmington 98, Del. Full color photographs demonstrate effective action; text shows application methods for best results. Check the coupon for your copy.

●

STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy coupon. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

How Electro-Matic Controllers Solve Problem of Congested Intersections

60. Traffic control system regulated by Electro-Matic Controllers continually adjusts to changing traffic patterns to clear traffic faster and relieve the problem of congested intersections. Be sure to investigate this method of expediting traffic flow at difficult intersections. Get full data from Automatic Signal Div., Eastern Industries, Inc., East Norwalk, Conn. Just check the handy coupon.

For Prompt Service Use The Coupon

Helpful Data on Street Lighting Equipment

193. Complete data on Monotube street lighting lighting standards together with information on brackets, mast arms and accessory attachments is available from Union Metal Mfg. Co., Canton 5, Ohio. Be sure you have the latest data on street and highway lighting equipment. Check the coupon now.

Street Lighting Application Curve Eliminates Calculations

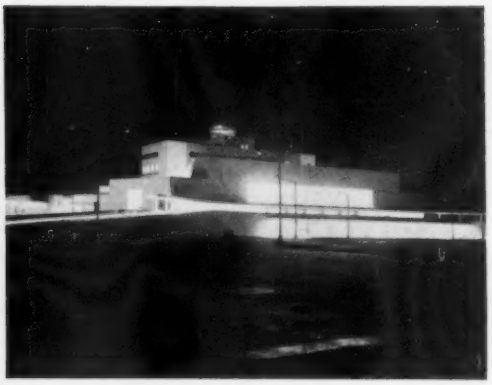
257. An easy-to-use chart from which illumination level, spacing and proper mounting height can be determined has been prepared by the Illuminating Engineering Laboratory, General Electric Co., West Lynn 3, Mass. For a copy of the chart and instructions on its use check the handy coupon.

Latest Data on Prestressed Concrete Lighting Standards

265. Comprehensive data on prestressed concrete standards for street and highway lighting is contained in a 24-page catalog which contains complete engineering tables and descriptive information on design features, mounting arrangements, base type choices and specifications of Hy-Lite standards. Get helpful and easy-to-read Catalog No. 300 by writing to American Concrete Corp., 5092 No. Kimberly Ave., Chicago 30, Ill., or check the coupon.

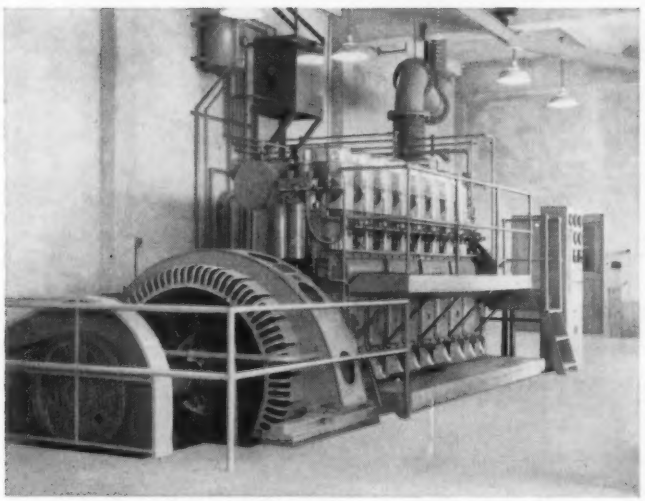
New Reflectorized Sign Faces Refurbish Old Traffic Signs

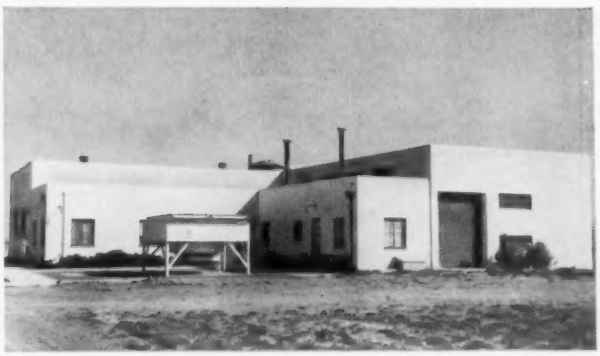
292. Get complete details on new "EZ-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.



Enterprise emergency power guarantees immediate light for the control tower, runways, and more than 466,000 sq. ft. area in terminal building with its three concourses. Here, 27 loading stations serve 11 airlines.

No blackouts at San Francisco Airport with 1000 KW Enterprise standby unit





First fully automatic unit of its type in the U.S., this Enterprise standby plant also powers drainage pumps in case of airfield flooding.

Compactness of the Enterprise engine enabled easy installation in the existing building.

Power failure at this busy new $50,000,000 International Airport would create emergencies of major proportions. But with the Enterprise diesel-electric, *fully automatic* standby generator set now in operation, this will not happen. Within 13 seconds, if power fails, the Enterprise cuts in to supply all the power needed for normal operation of control tower, runway lights, and other essential airport facilities.

Enterprise Engines serve every municipal power need. You'll find these dependable engines ideally suited for stationary or portable electric generating plants... flood or water supply pumping systems... or for powering sewage disposal plants. Contact the Enterprise sales office in your area today, or write us direct about your problem.

Further proof of Enterprise adaptability and vibration-free operation is shown by the use of the concrete cradle which was an integral part of the building.

Over a million horsepower at work the world over!

ENTERPRISE dependable ENGINES

THE SWITCH IS TO ENTERPRISE
CHOICE OF POWER EXPERTS

ENTERPRISE ENGINE & MACHINERY CO. • Subsidiary of General Metals Corporation • 18th and Florida Streets, San Francisco 10, California

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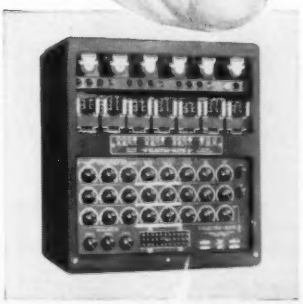

the Traffic Engineer uses controllers that think for his staff...

Of course we can't add engineers to your staff, but our Electro-Matic® Traffic-Actuated Controls can do a lot of thinking for you at your intersections. Electro-Matic® will move maximum traffic volumes with minimum delay under all conditions. A complete line of traffic-actuated controls is available for every type of intersection. Our trained specialists can assist you in the solution of your signaling problems.

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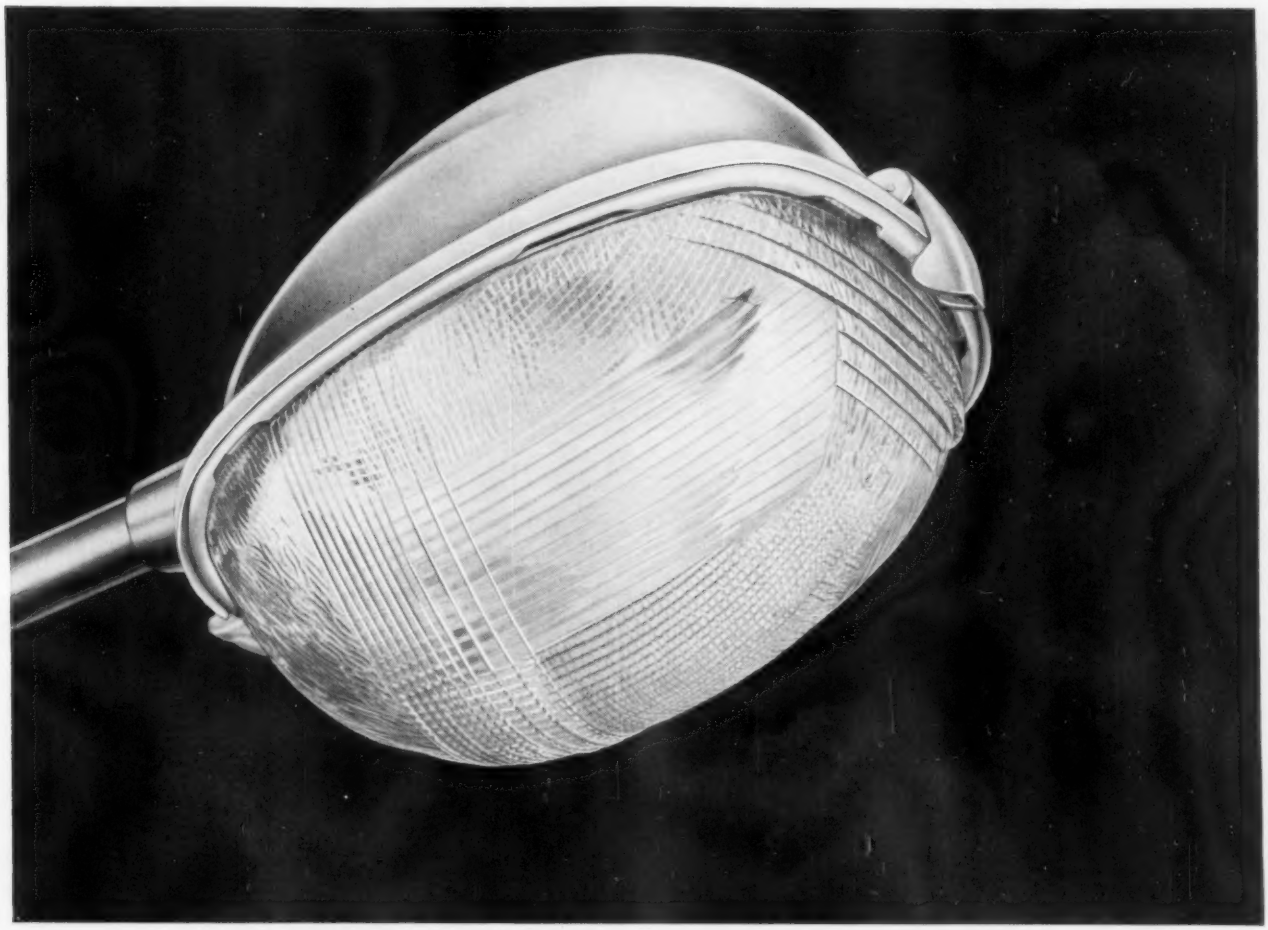


GENERAL ELECTRIC ANNOUNCES . . .

New FORM 400 Luminaire

General Electric's new Form 400 luminaire represents a major advancement in mercury street lighting. Its attractive, functional design makes the luminaire flexible and easy to service.

BETTER OVER-ALL VISIBILITY results from a unique optical design. Distribution patterns I.E.S. Types II and III are available, assuring high utilization and uniform pavement brightness regardless of street width.

EASY TO SERVICE, the Form 400 luminaire reduces maintenance costs. Hinged glassware speeds up maintenance, and no tools are required to detach either the reflector or glassware from the unit.

GREATER FLEXIBILITY is obtained with a choice of five different mercury lamps. In addition, the Form 400 can operate on conventional circuits with ballasts, or in series on the new Ballastless Mercury circuit.

MORE INFORMATION on this outstanding new development in mercury street lighting is available from your nearest G-E Apparatus Sales Office, or Authorized Agent, or by writing Section 452-155, Outdoor Lighting Dept., General Electric Co., West Lynn 3, Mass.

Progress Is Our Most Important Product

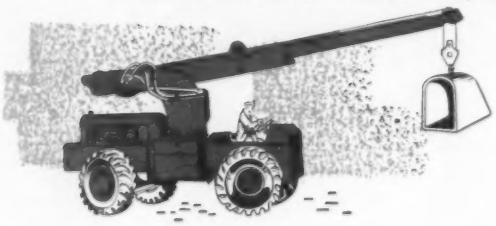
GENERAL ELECTRIC

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

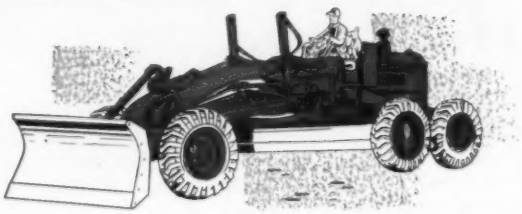
THIS JOB...
THAT JOB...
YOUR JOB...

A-W EQUIPMENT GETS IT DONE

Whatever the problem . . . whatever the job . . . those pictured above, or dozens of others, you can do it better with Austin-Western Power Graders, and the new tractor- and truck-mounted Hydraulic Cranes.



It's the LIVE BOOM that puts the A-W Hydraulic Crane out front in the performance parade . . . live power with instant response for all boom movements . . . extending and retracting, raising and lowering, and rotating. Fingertip hydraulic control handles delicate spotting jobs with superb precision. No other mobile crane has a boom so completely "alive" . . . no other outdoor-indoor crane will handle so many jobs, so well.



All-Wheel Drive provides 30% more Power-at-the-Blade; keeps the front end of the grader under control at all times. All-Wheel Steer makes the grader twice as maneuverable. Rear Steer shifts the rear truck from side to side, for better traction and smoother operation. The tougher the job, the more outstanding the performance of A-W "88" and "99" Power Graders in comparison with front steer, rear drive machines.

Austin-Western

Power Graders · Motor Sweepers
Road Rollers · Hydraulic Cranes

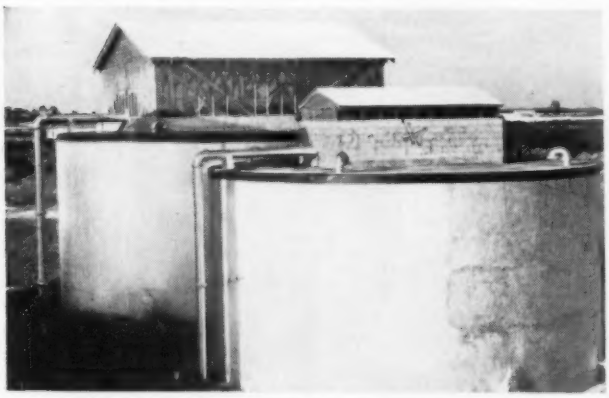
BALDWIN BLH LIMA-HAMILTON

Construction Equipment Division

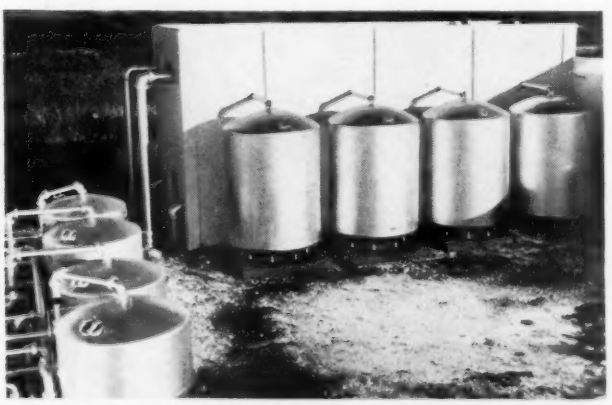
Manufactured by
AUSTIN-WESTERN COMPANY
Subsidiary of Baldwin-Lima-Hamilton Corporation
AURORA, ILLINOIS, U.S.A.

HOLLYWOOD (*Florida*) SAVES $32,980 A YEAR *regenerating its softeners with sea water*

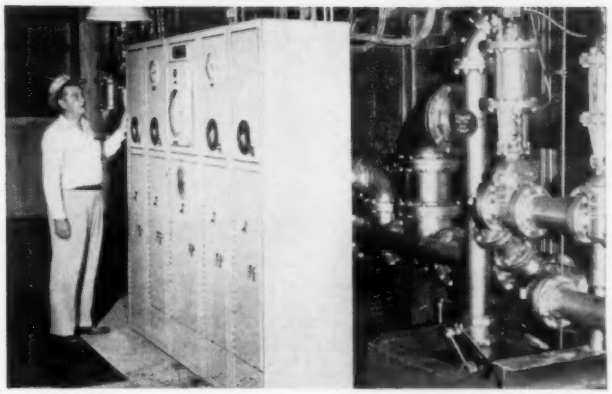
1. Pumps draw sea water from wells beneath this station. Being inland, these wells deliver a partially filtered sea water. (Regenerating costs are now $25 less per million gallons than when dry salt was used.)



2. To prevent marine growths which would foul equipment, the sea water is aerated and chlorinated.



3. Sea water then passes through Permutit pressure filters (left) and is ready for regenerating the Permutit softeners (right). Sea water pumpage is kept to a minimum because high-capacity Permutit Q, used in the softeners, requires less salt for regeneration.



4. City Engineer George A. Gieseke inspects the Permutit control panel. It backwashes, regenerates and rinses the 4 newest softeners and places them on the line . . . *all without aid from the plant operator!* Two men per shift operate the entire water plant.

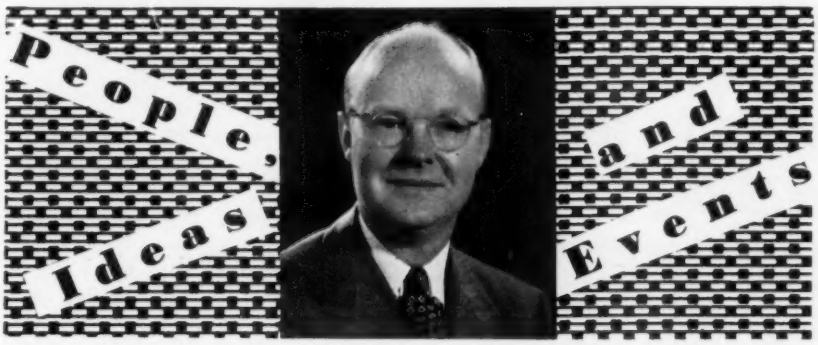
5. Hollywood is growing fast. Their first four Permutit softeners went on the line twenty years ago. Now there are 12 . . . and plant space for more. "We're in good shape," says City Engineer Gieseke.

It's easy to see why Consulting Engineers *Reynolds, Smith & Hills* chose Permutit equipment . . . for its long service life and low operating costs. And we'll be glad to help you make sure your water supply is "in good shape" for the future. Write to: Dept. PW-2, The Permutit Company, 330 West 42nd Street, New York 36, New York.

WATER CONDITIONING HEADQUARTERS

PERMUTIT

Get full details of this month's products . . . mail your Readers' Service card today.



by "Doc" Symons

H.T.M.A. — And as I write this on the last day of 1954, it's hard to realize that by the time these words appear in print, a month of the new year will already have passed by and most of us will be dating our letters and checks 1955 —most of the time, that is.

★ ★ ★

Speaking of the month of February, I'd like to enlist your aid in the campaign to adopt the World Calendar. That's the 12-month, four-equal-quarter, one-world-holiday-between-years, calendar proposed by the United Nations. It can be adopted next year if it gets the backing of the U. S. and Britain.

Then, and only then, will we be free of the mess we now have trying to compare average data for a 28-day February with a 31-day January or March. The idea is backed by many professional and business organizations. How about the AWWA and the FSIWA joining in to recommend adoption of the World Calendar.

★ ★ ★

For next summer—Here's an item on how to control trickling filter flies. According to "The Digester" of the Illinois State Dept. of Health, Harry Kepner of the Illinois State Farm at Vandalia, Ill., discovered quite by accident that filter flies are attracted to No. 1 fuel oil. Some had leaked out onto the ground and the flies swarmed to it and to their sticky demise. Once in contact with the oil they were trapped. So Harry set out a number of coffee cans partially filled with fuel oil. Soon the cans were half full of filter flies.—Some wag asked, "Can you afford to buy enough coffee, at today's prices, to get the cans needed to trap all of the filter flies?"

★ ★ ★

Also from "The Digester": Jacksonville, Ill., has taken to hauling wet sludge to ease the sludge handling problems. The increased load came from the discharge from Mrs. Tucker's Foods, Inc.—(Before and after eating?)—Hope some appreciative farmer is getting all that good soil builder from the liquid sludge.

★ ★ ★

Mail Bag — From one E. L. (Blue Print Now) Filby, of Black and Veatch, Cons. Engrs., Kansas City, Mo.—"Thanks for the squib re oil-water mixing which you reported in the Sept. issue of *Public Works*. Don't know when this happened, but then I'm—alas, alack—getting old. Of course, I am wrong—I have seen oil and water mix—fusel oil and oil as in the vintage of 1926 when mountain dew from South Carolina always had fusel oil as a main ingredient. Incidentally, back in our historic drought of the 1930's a town in Missouri actually bought water in Kansas and pumped it through an oil line to their lake some 40 miles away. The oil line company was a "common carrier" and could not turn down this "shipment." Burning the lake surface was indeed a sight!

Re: Cornell Reunion—Wonder if, with your usual eye for the ladies, you spotted my wife—she was there with the 1919-ers." Signed E. L., The Hobo.

★ ★ ★

Swedefinition — "Middle age is the time when most men are in the market for a new pair of swimming trunks—or—the time between when you are on the way up and on the way out."

★ ★ ★

This is Public Relations—Arthur Kuranz, Water Utility Manager, Waukesha, Wis., has a small printed slip to be enclosed with a water bill that is higher than usual. It calls attention to the increased consumption and says, "Perhaps there is a leak."—To this, one consumer replied: "Sure we have leaks here;

three new ones. There are four people here now instead of one. . . The water meter therefore works faster. Four people use more water than one—or at least they ought to!"

★ ★ ★

If you aren't on Don Bloodgood's mailing list for the "Sanitary Engineering News" of Purdue University, I suggest you write him. Now in its 13th volume, it is filled with fascinating bits of information on water and sewage treatment, industrial waste and public health, with an occasional motto, aphorism or bright saying thrown in.

Here's a sampling from a recent issue: "The isotopes of Strontium, Sr^{89} and Sr^{90}, are among the most potentially hazardous of the products of nuclear fission.—If 2000 fireflies were to glow in unison, they would produce only as much light as one candle.—If a ditch for a water main is not properly backfilled, the pipe may be unevenly supported and an extreme strain placed on it.—Worry Kills energy, purpose, vitality and produces nothing."

★ ★ ★

Luminous Quote — "Water is alright, if you use it in the right spirit."—R. H. Shook, Toronto, Can.

★ ★ ★

I heard somewhere—That F. W. (Kit) Kittrell is back with the U. S. Public Health Service after a sojourn in the commercial field. His Christmas card didn't say, but I heard that he will be located in the Chicago area.—That right, Kit????

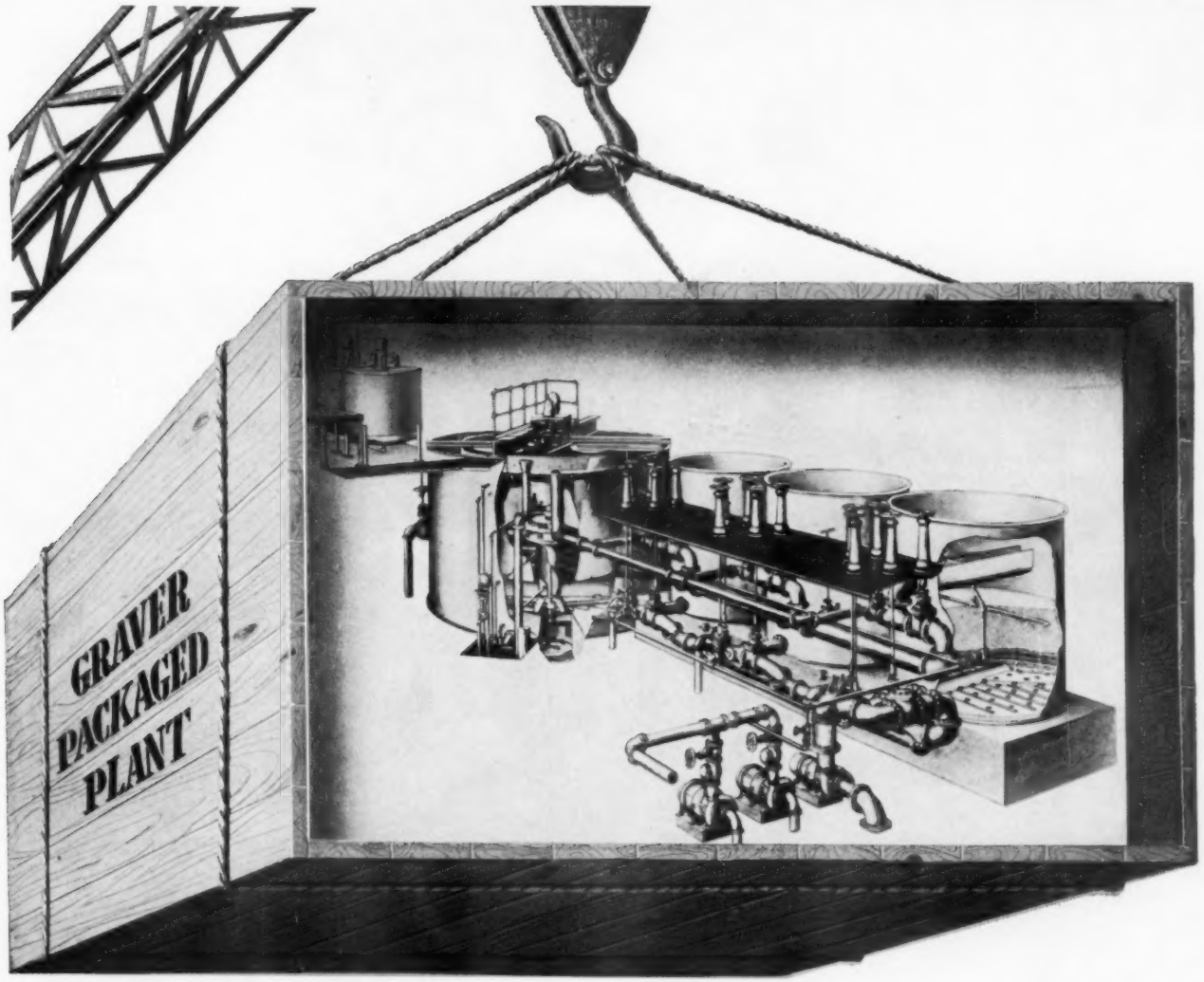
★ ★ ★

Dec. 17, the North Jersey Water Conference held a panel discussion of "Distribution System Practice" with Ed Walysyk, John Ogden, Joe De Boise, and Pete Ryerson participating.

Dec. 18, Long Island Water Conference held its Christmas party at the Manhasset-Lakeville Water District. A short inspection tour of the plant preceded the refreshments.

More than 100 persons attended a symposium on the Future Water Supply of Southern California. The meeting was sponsored by two groups of Professional Engineers. Among those appearing on the program were Mac Bookman of the Calif. Div. of Water Resources; C. C. Elder, Ch. Engineer, Metropolitan Water District; Burton Grant, Chief Engr., Los Angeles Water & Power Dept.;—A. M. Rawn, Ch. Engr., Los Angeles County San. Dist.; and others.

V.T.Y.—Doc Symons



This Graver-designed plant treats water for less cost per gallon

You get more for your money with Graver's "packaged" plant for water treatment and filtration because there are these savings:

1. ENGINEERING – Pre-engineered, standard equipment designs in capacities up to 2 M. G. D. . . . custom-made designs for larger capacities . . . functionally integrated to minimize equipment cost, space and costs of chemicals . . . with resultant savings to the customer.

2. PRODUCTION – Responsibility centralized in one dependable equipment supplier for maximum economy in fabrication, assembly and construction.

3. OPERATION – Designed with simplified controls and up-to-date materials of construction to minimize necessary operating attention.

A Graver "Packaged" Water Treatment Plant includes (ready for installation): High-rate, solids-contact coagulation and softening Reactivator® of either concrete or steel construction; gravity or pressure filters; clearwell, chlorinator, wet or dry chemical feeders, recarbonator where required, and controls. There is nothing more to buy.

Write for Graver Municipal Bulletin and Sample Layouts.

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Yellowstone County owns Cat-built Motor Graders and motor graders of competitive manufacturers—eleven in all.

Operation costs for the Caterpillar No. 12 Motor Grader pictured here showed that, for 12 months, it cost $1.12 per hour less than the next closest comparable motor grader of competitive make. And it cost $3.11 per hour less than motor grader C. Figures include depreciation, wages—everything. These are not Caterpillar statistics. Yellowstone County kept complete cost records on the maintenance of 2000 miles of roads.

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- **Caterpillar No. 12 Motor Grader . . . $5.60 per hour**
- **Motor Grader B . . . . . 6.72 per hour**
- **Motor Grader C . . . . . 8.71 per hour**

Figures for two machines purchased in 1941 are as follows:

- **Caterpillar No. 12 Motor Grader . . $6.45 per hour**
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All of the Caterpillar machines—regardless of the date of purchase—cost less per hour than *any* of the six competitive machines. Even Yellowstone's 15-year-old Cat* No. 12 Motor Grader cost $2.55 less per hour to operate than a competitive machine only three years old!

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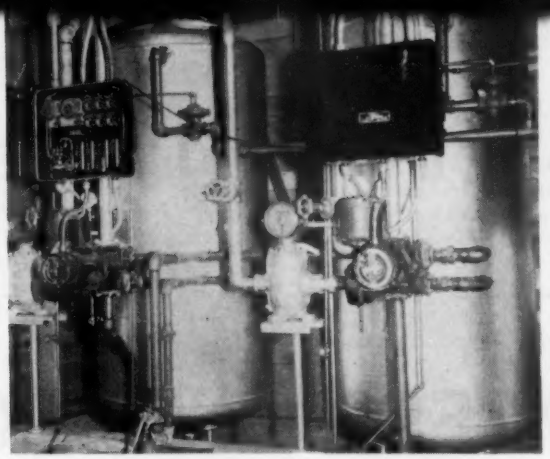


● DEFLUORIDATION plant has automatic controls synchronized with water meter.

TREATING A HIGH FLUORIDE WATER

A WATER defluoridation plant, unique in the list of public water works in the United States, is operating on the main post of Camp Irwin, California. This plant, consisting of twin pressure filter units with automatic regenerating controls, is the largest of its type in the country. Equipment was supplied by Permutit Company of New York City. Since July the plant has provided residents of a 200-family housing unit and a 50-space trailer court with low fluoride-content water for cooking and drinking purposes.

Camp Irwin, home of the Armored Combat Training Center, sprawls across the Mojave Desert with its northern boundary cutting across the Furnace Mountains which hem in one side of Death Valley. The Camp lies on the old 20-mule-team borax trail traversing a highly mineralized region. Its water supply, obtained from six deep wells, has a normal fluoride content of from 9 to 12 ppm. While this concentration is of little or no consequence to the health of servicemen stationed there and to most other adults, it is a different story with children under the age of twelve and a matter of concern for pregnant women. The tooth structure of the very young, including unborn infants, is seriously affected by an excess of fluorides in the water.

Although traces of the mineral are necessary for development of sound teeth, the U. S. Army Surgeon General and the U. S. Public Health Service agree that concentrations higher than 1.5 ppm will cause permanent disfiguration to children's teeth if used over any considerable length of time.

Residents of the housing and trailer areas now obtain low-fluoride water through a special distribution system that brings it direct to their homes. It is piped to the cold water tap at the kitchen sink and to the cold water tap at the lavatory in the bathroom of each house. A separate water tap is provided at each trailer site. For reasons of economy, the normal post water supply is piped to each residence for all other purposes.

Fluorides Cut to 0.6 ppm

Tests taken during the first 30 days' operation of the plant show that fluoride content of the treated water is reduced to between 0.60 and 0.80 ppm. Until the plant went into production this summer, Camp Irwin engineers were forced to haul in drinking water by tank truck from Barstow, 37 miles away.

Specifications and plans for the defluoridation plant were prepared by the Engineer Section, Headquarters Sixth Army, Presidio of San Francisco, Calif., in cooperation with the Public Housing Administration, the agency which erected and now operates the housing project at Camp Irwin.

The Army and PHA shared the cost of the plant with the Army underwriting 40 percent and the PHA 60 percent of the $28,000 total. The distribution system that pipes the treated water from the plant to the house and trailer taps was accomplished separately.

Housed in a small frame building, the plant consists of two separate pressure filter units each capable of treating 15,000 gallons per regeneration cycle at an average flow of 20 gpm and a maximum flow of 33 gpm. The filter and regenerating tanks were specially constructed and lined with corrrosive resisting material for this service. Each unit is capable of handling the total load anticipated at peak consumption but to date maximum production has not been required.

The filters operate on the ion-exchange principle. The exchange material is activated bone carbon sold under the trade name of Fluo-Karb and is regenerated by the use of caustic soda and phosphoric acid. When the fluoride saturation point of a unit is reached, after treatment of 15,000 gallons, it automatically goes into the regeneration phase while the second unit cuts in to provide a continuous flow of treated water to the distribution system.

The system of automatic controls reduces the manpower requirements to operate the plant to two hours per day. This time is spent mainly in preparing regenerating chemicals, testing and record keeping. The major operating expense of the plant is the cost of chemicals which, prorated at current prices, is $1.20 per 1000 gallons of water treated.

Capacity of the plant was computed on the basis that 10 gallons of treated water per day per capita would be required. Population estimates were based on four persons per house and three per trailer.

This article was prepared in Headquarters, Sixth Army and was furnished us by the Information Section of that Headquarters.

Lights, Signs and Traffic Markings Help Reduce EXPRESSWAY ACCIDENTS

PHIL HIRSCH

MOTORISTS need special training before they are able to drive safely on modern expressways. That is the conclusion of Cook county (Ill.) highway officials who have analyzed accidents on Edens Expressway, which starts at the northwest edge of Chicago and runs 13 miles to the Cook county line. But they also need good lighting and proven traffic control devices and signs.

Most of the 17 fatal accidents that occurred on Edens during the first two years of the superhighway's operation, from September, 1951, to September, 1953, occurred for no apparent reason. Following is a typical example, abstracted from the report of a coroner's inquest:

A man was driving north on the expressway in his 1953 Plymouth. He went off the road into the median strip and struck the center pier of an overpass. The driver was thrown out of the car by the impact, landed 10 feet away, and was dead when police arrived a few minutes later. The automobile was completely destroyed. This accident occurred at 9:15 AM on Feb. 26, 1953, a clear, dry day. The location was an almost straight section of pavement near the south end of the expressway.

Typically, there were no skid marks at the scene of the accident, indicating that the driver's reaction time was far too slow for the speed at which he was driving. It is for this reason that Cook county officials believe the average motorist needs special education to cope with the hazards peculiar to expressway driving.

This conclusion is also based on experience. In August, 1953, Cook

● **TYPICAL** sign on Edens Expressway guides motorist to exit road. White letters against a dark green background provide nighttime visibility at 500-ft. distance.

● **CLOSEUP** of expressway shows 1,000-foot acceleration lane (at far right) which permits motorists to reach expressway speed before entering main traffic stream. Note also cable running down center of median strip to prevent U-turns across road.

County Highway Superintendent William Mortimer invited reporters from Chicago's four daily newspapers to a press conference. At the conference, officials explained the motoring perils found particularly on expressways. During the next several days, stories based on this information appeared in all four papers. For the next five months, there wasn't another fatal accident on Edens.

Public Relations

Perhaps the most effective article appeared in the *Chicago Daily News*. The story pointed out that at slow speeds, the driver might be able to shift indiscriminately from one lane to another and survive, but at the high speeds encountered on expressways, the chances of escaping death are much slimmer. Motorists were reminded that higher speed requires much greater distances between cars, and that entering an expressway is a much trickier proposition than driving from a side street into a main thoroughfare in the city. Pictures accompanying the article showed the proper use of acceleration lanes, the danger of stopping a car on the pavement, and hazards involved in making U turns across the dividing strip.

This public relations program had one other result, perhaps even more important than its educational value. Immediately after publication of the stories, which included a rundown of the accidents during the previous year, the daily traffic count fell off 25 percent.

Superintendent Mortimer is convinced that the safe driving pointers outlined in the stories were a major reason for the perfect accident record of the next five months.

County highway officials used engineering as well as public relations to attack the accident problem that had developed during the first two years of the expressway's operation. Of the 17 fatal accidents, four had involved pedestrians, who were either walking along the edge of the pavement or trying to cross the expressway at the time they were killed. In three more fatalities, one of the vehicles had been headed in the wrong direction.

Efforts were made to solve the first problem by erecting high fences along either side of the expressway in populous areas. The second problem was tackled by erecting a steel cable down the center of the median strip. The cable is eighteen inches above the ground and is supported by two-foot high creosoted wooden posts. Also, barriers were placed along the pavement near entry and exit ramps, and between the expressway and nearby service roads. The barriers require cars to enter the expressway traffic stream only via entry ramps. The cable is designed to prevent U turns. Investigation by highway officials had shown this to be a serious problem.

Perhaps the most important conclusion to be drawn from the 17 accidents, Superintendent Mortimer believes, is that the time and effort that went into the design of Edens was not wasted. As he put it: "The numerous safety features engineered into the expressway have withstood the test. Examination of all the fatal accidents on Edens, with checks against coroner's or police reports, does not indicate that design was at fault in any case."

But there are several other design features which have played an important, although intangible, role in the expressway's comparatively low accident rate, Mortimer believes.

Horizontal and vertical elevations are designed to have a maximum rise or curve of three percent. This provides a minimum sight distance of 700 feet. Width of the median strip separating the three 12-foot wide lanes running in either direction ranges from 18 to 25 feet. Six-inch crushed gravel shoulders are four and one-half feet wide along the inner (median strip) side of the expressway, and 11 feet wide along the outer edge.

Entry and exit systems at each intersection are engineered to prevent excessive speeds. Exit ramps have a throat measuring 20 feet wide. This width will accommodate a car traveling at seven-tenths of the 60 mile an hour posted speed limit. The exit ramp has a curve which requires the motorist to slow down to 25 miles an hour by the time he reaches the end of it.

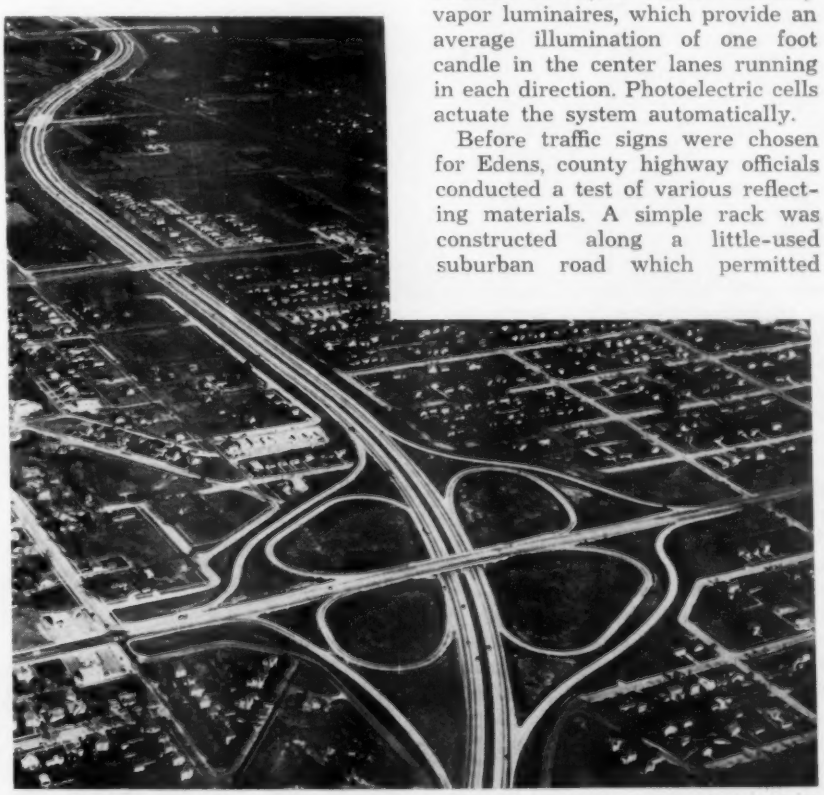
This was accomplished by designing successive sections of the curve to shorter and shorter radii. When the motorist enters a typical exit ramp, he's following a curve with a radius of about 900 feet. By the time he reaches the end of the curve, the radius has declined to less than 200 feet.

At the cross road, the opening of the exit ramp is 14 feet wide. This width is designed to permit only one car to leave the exit at a time. Entry ramps are designed in the same way, except that the curve and the dimension at either end are reversed.

Lighting and Traffic Signs

Lighting on Edens expressway consists of 20,000 lumen mercury vapor luminaires, which provide an average illumination of one foot candle in the center lanes running in each direction. Photoelectric cells actuate the system automatically.

Before traffic signs were chosen for Edens, county highway officials conducted a test of various reflecting materials. A simple rack was constructed along a little-used suburban road which permitted



● **AERIAL VIEW of an intersection on the Edens Expressway. This modern highway extends from the northwest edge of Chicago to the Cook County line, 13 miles away.**

either shoulder mounting or any elevation of overhead mounting up to 16-foot clearance. Two 20,000 lumen mercury vapor luminaires were mounted on poles in the vicinity of the sign rack so that tests could be made with and without lighting. Manufacturers of reflectorizing materials were invited to submit a test sign with a jumbled message of 12-inch letters.

Legibility observations were made from a vehicle as it was driven slowly toward the test sign, under the following conditions: shoulder mounting with high and low beam headlights; overhead mounting with high and low beam headlights; observation of both mountings with and without mercury vapor lighting. Observers were officials of various highway agencies, but the makeup of each group varied on each test.

Results showed that a sign with white reflectorized background and black letters gave the lowest legibility readings. This was a significant factor in the choice of the ultimate color combination—a white letter against a dark green background. Three types of reflectors produced satisfactory results, but the one containing molded plastic buttons indicated superior legibility. Therefore this type of material was used throughout the system, except for two interchanges where other materials were used to provide comparative data under actual traffic conditions.

Signs are Standardized

Three standards govern sign messages on Edens expressway. All messages have a maximum of three lines of copy. Arrows are drawn at an angle approximately the angle the driver will follow, but in no case is an arrow placed in a horizontal or vertical plane. Where such arrows are required, a one-in-seven slope is used. The word "exit" is used throughout the system, instead of the word "outlet."

Five types of signs are used on Edens. The first sign that is seen as a driver approaches an intersection designates the crossroad. The next is a map sign. Its purpose is to indicate the traffic movements that are possible through the interchange. It was felt that this type of sign was necessary because of the varying geometry of the interchanges, which include partial and full cloverleafs.

The third sign is placed in the nose between the ramp and the through pavement. This sign identifies the intersecting road by name, by route number if one applies, and by community designation. A few feet beyond the interchange, there is a fourth sign, showing the name of, and the distance to, the next exit ramp. The fifth sign is erected at cross streets where no interchange is present. This sign helps to orient strangers, and has proved helpful in the location of accidents.

Lettering in most cases is 12 inches high. The community designations in the signs at the ramp takeoffs are in eight-inch letters to subordinate this information to the copy referring to the name and direction of the crossroad. Information signs following the interchanges are six inches high, while the bridge name signs contain eight-inch letters.

The first sign in advance of each interchange is placed approximately 2,000 feet in advance of the ramp takeoff. When the nighttime legibility of the sign, approximately 500 feet, is added, ample distance is provided to enable drivers to get into position to make the required movements at interchanges without hazard to themselves and other drivers.

The large signs contain a lumber framework of 2x4's, 4x6's and 2x6's. The sign backing is of one-inch plywood. The smaller signs contain plywood backing and are mounted on 4x4 creosoted poles. Edge clearance ranges from 4½ to 10 feet. Bottom edge of each sign is a maximum of 4½ feet from the ground, and the installation is made at an angle of approximately 85° with the center line of the through pavement.

The value of this careful attention to signing and other design features is indicated in a comparison of accidents on Edens during the first two years of its operation with similar statistics for Skokie during the last year before the expressway was built.

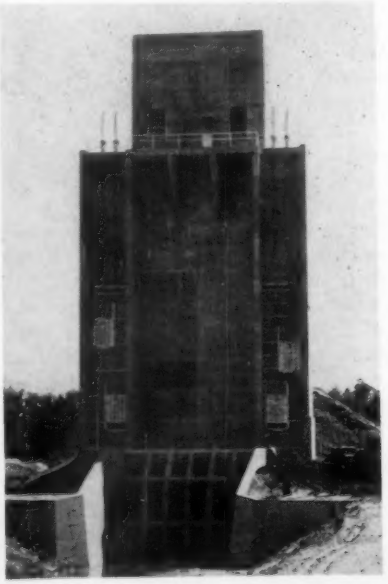
In 1951, the year before Edens was opened, traffic on Skokie amounted to a total of 720,000 vehicle miles. The accident rate per 100 million vehicle miles was 556, and the death rate was 9.7. In the first two years Edens was open, total traffic amounted to 2.39 million vehicle miles. In spite of higher average speed (roughly 60 miles an hour on the expressway, compared to 50 miles an hour on Skokie), both the accident and death rates were lower on Edens than on Skokie. The accident rate during the first two years Edens was in operation was 104 per million vehicle miles, and the death rate was 7.5 per million vehicle miles.

Sluice Gates at Different Levels Permit Selective Drawing of Reservoir Water

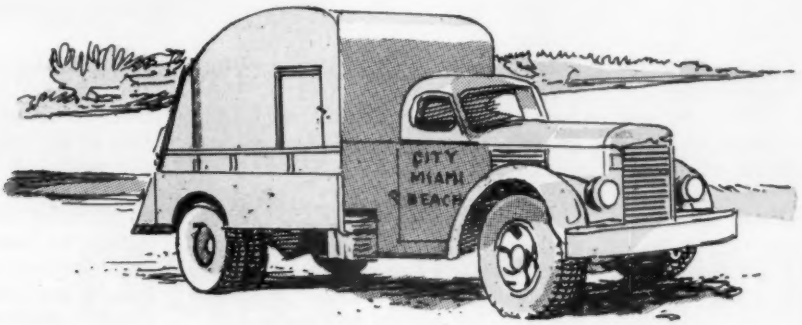
Water will soon fill the Garza-Little Elm Reservoir, located 22 miles northwest of Dallas, Texas. It is one of four reservoirs which will provide flood protection, controlled water supply for irrigation in times of drought, water supply for towns and cities, and new recreational facilities.

The earthwork dam is 125 feet high and over 6 miles long, and will impound 170 billion gallons of water. Near the eastern end of the dam is located an uncontrolled spillway as a safety measure against floods greater than any heretofore experienced. Near the middle of the dam is the outlet structure pictured. Essential to its functioning are the four Rodney Hunt cast iron bronze-mounted sluice gates which control the flow of water between the reservoir and the city of Dallas. The gates are located at various levels to permit selective drawing of water from different strata of the reservoir.

The gates are 60 by 84 ins. in size and operate under heads of 25 to 48 ft. They are of the rising stem type with side, top and bottom wedges to insure positive seating. The gates, which are controlled by floorstands with selective two-speed crank-operated hoists, are totally enclosed and equipped with Timken tapered roller bearings.



● **OUTLET works for reservoir was built before making the lake it will control. Four sluice gates are shown mounted on the sides of the structure.**



Refuse Collection Problems in a RESORT CITY

C. E. WRIGHT

MIAMI Beach, "The Magic City," has more problems than the average city in its garbage and trash collection. These are: 1. It has no place within its confines for disposal, either by sanitary fill or incineration. 2. Absolute cleanliness is essential in a city which has a hundred thousand or more visitors at a time in its nearly 400 hotels and hundreds of apartment houses and motels. 3. It has a floating population which is several times the size of its all-year population and it must cope with a fluctuating demand for service, which rises to a peak in February and hits a low point in the autumn months. 4. Collections must be made frequently in the year-around warm weather to guard against breeding of flies and other insects. 5. The department must be ready at all times during the hurricane season from May to November for a several weeks' clean-up of debris after a wind of gale force. Clean-up after a savage storm has taken as long as two months. 6. Collection of tree trimmings is a year-around problem.

The size of the Miami Beach garbage and trash collection problem is indicated by these facts: While the resident population is about 50,000 (46,282 in 1950 census), there are more than 5000 homes, more than 200 duplexes, 900 apartment houses, about 250 rooming houses, nearly 400 hotels and many restaurants.

Years ago, when Miami Beach was much smaller, both in resident and transient population, garbage was placed on barges which were towed out into the ocean and dumped. Of late years Miami Beach has utilized the incinerator plant of the City of Miami, requiring an eight-mile haul, at a cost of $3 a ton, which is double the charge made up to 1946. Some of the wet garbage from hotels and restaurants is hauled to a hog farm in the northern part of the county, a longer haul but more economical because there is no expense for disposal. To save on hauling costs, all loaded trucks are taken by their crews to the sanitation department yard, where they are turned over to a driver who goes alone to the disposal area. The collection crews then take out another truck. Hence their time is not wasted during the hauling operation.

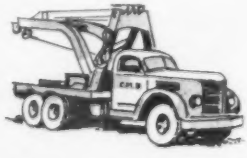
Collections are made every day from hotels and restaurants and three times a week from residences and apartment houses. Because of risk of offending odors, enclosed Gar Wood Loadpackers are used on garbage routes. Wet garbage is picked up by enclosed Leach Refuse Getters and disposed of at a hog farm or incinerated. Open trucks are used exclusively, however, for picking up crates, cartons, old tires and tree trimmings, which are hauled to a city dump west of Ojus, which lies north of Miami. Semi-trailers of 37, 40 and 47, and one of 57 cu. yd., capacity are employed for handling and hauling tree trimmings, which are picked up by truck cranes. There are so many coconut palm trees and so much shrubbery in the Miami Beach area that trimmings and debris from trees present a constant service problem. From 600 to 700 cu. yds. a day are hauled to the Ojus dump, let dry and then burned in the open.

● **TRUCK FLEET** used by Miami Beach for municipal services. Sanitation Department trucks predominate. Semi-trailers, left center, haul bulky tree trimmings.

Clean-up after storms presents a big problem all of its own. A hurricane leaves the streets littered with debris of all kinds. For such emergencies the department maintains a reserve fund of $250,000. The job is much more difficult than snow removal in Northern cities

and takes longer, usually several weeks. For lifting heavy trees or branches that have been blown down, a Unit truck crane is kept ready for service. A Michigan shovel with clam shell is rented to help out. These trucks are also used the year around for loading trailers with tree trimmings. With extra equipment, clean-up crews have handled as much as 2000 cu. yds. a day. After a severe storm up to several thousand fallen palm trees are cut up by power saws and hauled by semi-trailers to the Ojus dump for burning.

Garbage collections in a typical year have fluctuated from a low of 700 tons a week in September, 1953, to a high of 1440 tons in the week ended February 24, 1954. The smallest collections are from May to mid-December, with a sharp rise over the Christmas and New Year's holiday weeks and a continued high rate through January and February, reaching a peak at the end of February and then dropping off again until the summer season of June, July and August. This has introduced a new factor. The spring slump at one time lasted through the summer, but now most of the Miami Beach hotels remain open the year around, with summer patronage almost equalling that of mid-winter. There are noticeable bulges in Easter week and the week in which the Fourth of July falls.



Equipment and Supervision

To service this fluctuating load the department has 19 Loadpackers, two Sanivans, five wet garbage trucks, eight open trucks and eight semi-trailers. The latter are used for tree trimming collections. Several times a year changes are made in the route coverage to accommodate the changing situation. Four runs are added in the winter months to those operated during the remainder of the year. Each truck has a driver and two helpers. Drivers are paid $1.39 an hour and laborers from 90 cents to $1.25, plus a cost-of-living bonus of $45 a month. All crews are required to complete their daily runs even though it may take nine, ten or more hours. Straight time is paid for overtime work.

There is constant supervision over the collection crews by district sanitary inspectors, who are likely to show up on a route unexpectedly, especially if there have been complaints. These inspectors are also required to spend two days a week on a route truck to study conditions and make suggestions for improvement in service. They investigate complaints and make daily report on how they were handled. This close inspection has reduced the number of complaints, which have averaged only 40 a week since March, including starts and discontinuances. In the Christmas-New Year's holiday week complaints soared to 295, but that figure included a large proportion of starts.

Complaints are received either at City Hall or at the sanitary yard and are recorded on a special form, then relayed to the sanitary inspector covering the district from which they came. He in turn relays them to the truck driver. The Miami Beach sanitary department makes the boast that there is a pick-up in almost every instance within two hours from the time a complaint is received.

It is the duty also of the sanitary inspectors to see that garbage receptacles in alleys and in business and apartment house areas are sprayed two or three times during the summer months to prevent breeding of flies and other inspects. Because of the high water table in the Miami area and heavy rains in the summer months underground refuse cans are generally not feasible, so conventional garbage cans are largely used. However, to cover their unsightliness there is a widespread trend toward use of concrete receptacles into which they can be placed. Inspectors are constantly trying to impress upon complainants that a sufficient number of cans must be used for a cleanly appearance. This eliminates trouble of overflowing of cans.

Miami Beach imposes no special tax or charge for garbage and trash collection. The cost comes out of the general budget. In the current fiscal year the garbage and trash budget is $806,150, of which $584,000 is for garbage and trash, $170,000 for tree trimming collection, $43,000 for lot cleaning and the remainder for administrative expense. The cost of these services has been growing at about 10 per cent a year due to a steady increase in number of both residents and transients. In the fiscal year 1948, for example, the budget was $635,000.

Vacant lot cleaning is regarded as a municipal function. As many owners of property are absent a part of the year, the city undertakes the work of keeping down weeds and tall grass so that the general appearance of the city will not suffer. In some cities a charge is made for such service, but in Miami Beach the cost comes out of the general sanitary fund.

Survey of Unit Costs

A survey has established unit costs for various types of work. In congested apartment houses, the cost per ton for garbage and trash collection was $8.26; in residential section "A" it was $10.57 per ton; in residential section "B" it was $12.26; restaurant swill cost $5.47 per ton, while hotels ranged from $8.83 to $10.84 per ton collected. The average cost per collection for residences was 16.5 cents, and for apartment units 4 cents. A similar survey made in 1947 showed costs at that time both higher and lower than the costs of the recent survey, but more apparently higher in 1947 than in 1953.

Sanitary work in Miami Beach is handled by a sub-section of the city engineering department and is under the supervision of Morris N. Lipp, city engineer, who is also assistant city manger; V. W. Sills, assistant city engineer; and Frank E. Hoban, superintendent of streets and wastes. Miami Beach operates under a city manager-city council type of municipal organization. A city shop is operated for the maintenance of all city equipment.

North of Miami Beach are several smaller communities which have much the same problems in garbage and trash collection and disposal. Surfside, Bay Harbour, Biscayne Park and Miami Shores cooperate in a plan of collection and disposal. Refuse is hauled to a sanitary fill in north Dade County, 12 miles away, a former naval gunnery range. Surfside, which handles the job, collects 20 cents per cu. yd. from the other communities for garbage and nothing for trash, which is burned. Each town does its own collecting and hauling. Surfside handles the fill under the supervision of county health officers. Garbage is placed in trenches. Trenching and filling is done by an International tractor with bulldozer attachment. Bay Harbour Islands, a residential community above Miami Beach, handles its refuse through a private company, Modern Waste Service of Miami.

Horizontal Wells Solve COUNTY WATER PROBLEMS

DWINDLING water supplies have created an emergency throughout the Middle West during the past two years. The great drought that has raised havoc in the West since 1942 is now reflected in rainfall records of Illinois, Ohio, Wisconsin, Indiana, Missouri and Kansas. Precipitation in Southern Illinois, one of the hardest-hit areas, was more than 30 inches below normal between April, 1952, and January, 1954.

Lack of rainfall has lowered the water table to the point where many communities have had to sink new wells or deepen existing ones. In the Chicago area, although precipitation is only five to ten inches below normal, increased consumption has created the paradox of water shortage in a region that includes one of the largest bodies of fresh water in the world—Lake Michigan. This increased consumption has been caused by the flight from the cities—from communities like Chicago, which has the funds to build expensive filtration plants and intake pipes, to suburban municipalities which have had to rely on wells because they lack the money to tap the lake's unlimited supply.

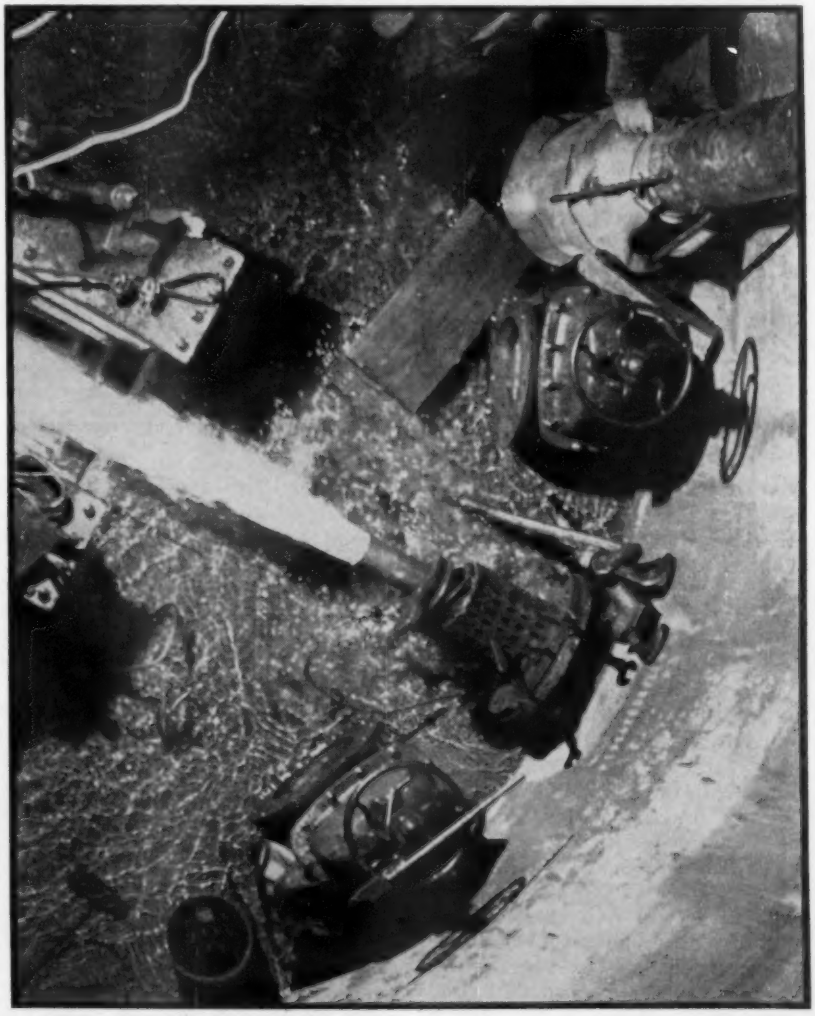
Solution for Lake County

Lake County, Ill., which borders Wisconsin on the north and the lake on the east, has found a solution to its water shortage—one which can be copied by many communities near surface water supplies. Sixteen communities in Lake County have formed the Lake County Public Water District. The district erected a water supply system and began drawing water from Lake Michigan last fall. But, since no filtration plant and no lengthy intake pipes are involved in the project, the new facilities will be built at comparatively low cost.

Initially, the project will benefit Zion and Winthrop Harbor, Ill. Zion, a town of about 9,000, is roughly 50 miles north of Chicago. Winthrop Harbor, which has 2,500 residents, is about two miles north of Zion. Both communities, although they are less than a mile from the lake, have been plagued by chronic water shortages.

The water famine in Zion has been especially severe. The community obtains its supply from two wells, each almost 1,000 feet deep. In December, 1953, an impeller bowl in one well broke, and the well was out of service for nearly a month. A third well that had been sunk for just such emergencies, helped supply the 6, 8, and 10-inch mains that comprise the municipality's distribution system. But even so, Zion officials had to appeal to residents to use as little water as possible. In spite of community-wide cooperation, the water stored in Zion's 500,000-gallon elevated storage tank dropped dangerously before the damaged well was repaired.

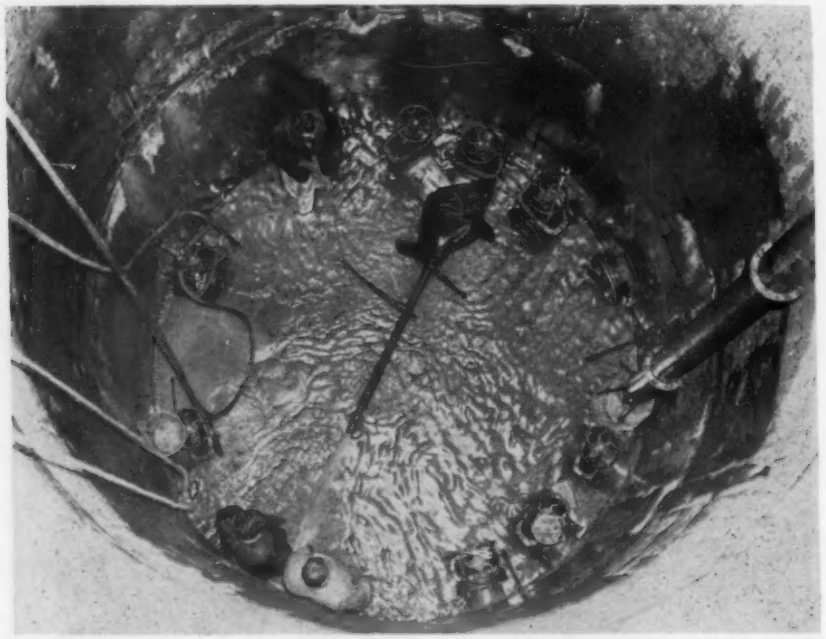
Three months later, the same well again gave trouble. On two occa-



● **PLENTY OF WATER** rushes out when test valve is opened. Gate valves are at inboard end of perforated tubes, 200 to 300 feet long, extending from caisson.

sions, in March, it was out of service for periods of two to three days. The repair bill, from December to March, totalled $8,000; but even without these difficulties, Zion had water troubles. During the summer of 1953, which was particularly torrid in the Chicago area, officials had to ask residents to limit their use of water.

Homeowners were requested to sprinkle their lawns every other day, instead of every day. To reduce the peak load, residents living at even-numbered addresses sprinkled on even-numbered dates, while those living at odd-numbered addresses sprinkled on odd-numbered dates.



● INTERIOR of 13-ft. dia. caisson, showing gate valves located at circumference.

Detailed instructions on how to conserve water used in washing clothes, and for bathing and drinking, were also provided.

Water consumption in Zion during 1953 was 18 million gallons higher than during the previous year. The July-August peak totalled 30.7 million gallons, dangerously close to the 500,000 gpd capacity of the system. Foreseeing this situation some two years earlier, Zion officials joined with other water-short communities in Lake County to form the public water district.

The water agency was created by special act of the state legislature. There are five trustees, appointed by the judge of the Lake County court to five-year terms. Money for projects approved by the Lake County Public Water District comes from the issuance of revenue bonds retired from charges for the water supplied by these projects.

The Lake Michigan project is the first one undertaken by the board. It involves construction of a Ranney-type water collector about 50 feet from the shore of Lake Michigan at a point near the northern corporate limits of Zion. Ranney engineers are supervising the installation. From the collector, a 14-inch main will be built to Zion's elevated storage tank. A 10-inch main, hooked into the 14-inch pipe, will carry water some three miles to the Winthrop Harbor pumping station.

Construction will soon begin on the supply lines. Plans are now being drawn for a pumping station, which will be erected on top of the collector. The station will include two 1,000 gpm pumps, with provision for a third. Cost of the collector is estimated at $86,000. Another $60,000 will be needed for the supply line to Zion. The Winthrop Harbor line and the pumping station will probably bring the total cost of the project to $350,000 or $400,000.

The area in which the collector is located is composed of fine sand and boulders ranging up to four inches in diameter, extending to a depth of about 30 feet. Several other Ranney collectors have been installed in the Midwest—notably at Manitowoc, Wis.; Chillicothe, Ohio; and Monsanto, Ill.—evidence that the necessary sand formation is widespread through this area.

Briefly, this is how the installation works: The collector which will be used by the two Lake County communities consists of a reinforced concrete caisson, 13 feet in diameter and 28 feet deep, with walls eight inches thick. At the bottom of the caisson are four 8-in. perforated tubes which extend into the sand layer under the beach some 200 to 300 feet. Lake water filters through the sand and into the tubes.

The installation has sufficient capacity to supply water to at least two other communities, it is estimated. At present, four other Lake County communities—Gurnee, Libertyville, Lake Bluff, and Mundelein, are studying the possibility of tapping the lake for part of their supply. Plans for a second collector, south of Zion are being discussed. Providing lake water to these four communities would require expenditure of about $1.4 million for collectors and supply lines.

Meanwhile, Zion has signed a 30-year contract with the Lake County Public Water District, which is to supply 155 million gallons of water a year from the collector now under construction. Winthrop Harbor, under terms of a similar contract, will receive 31 million gallons a year. Zion will pay 14 cents per thousand gallons, Winthrop Harbor 18 cents per thousand gallons. This will cover construction costs of the system and debt service on the 20-year revenue bonds; and will leave a small amount for administrative costs of the district.

The new water supply will be an improvement, qualitatively as well as quantitatively. Zion's present water supply, which will be kept in use for emergencies, contains an average of 18½ grains of hardness, and has an iron content of 1.2 ppm. The lake water is less than half as hard and has an iron concentration of only 0.5 ppm.

The contracts with the water district provide that, if and when other communities tap into the collector, water rates will go down. Under this provision, the charge will never exceed the amount needed to pay for the facility. Also, if the system expands, Zion will receive payment for use of the beach property on which the collector stands.

It is likely that fire insurance rates in Zion will be reduced shortly, thanks to the project. Until now, the municipality's property owners have been paying a "class seven" rate. With the more dependable supply available from the lake, officials think they will be able to meet the requirements for a class six rating. The change would mean a reduction of 20 cents per thousand dollars' valuation, and a saving of about $10,000 a year on insurance premiums paid by Zion residents.

● **GREER, N. C., enters the roster of "white way" cities. Here is a nighttime view of a brilliantly lighted street showing some of the 62 luminaires recently installed. The new units give four to five times as much light for same power as old system.**

● **ATTRACTIVE Kerrigan standards support the luminaires and overhead wiring. One of the old street lights, not yet removed, may be seen below the "Ford" sign.**

AS MUCH LIGHT FOR THE SAME POWER

A NEW white way system has been installed at Greer, S. C., which gives four to five times as much light on the roadway for approximately the same power consumption. For this new lighting system, General Electric form 206 fluorescent units were used and these were mounted on Kerrigan "Weldforged" octagon shaft standards, Model 100 K 30.

There are 62 luminaires equipped with 72-inch T12 rapid start fluorescent lamps. The spacing is 100 to 115 ft., staggered. The average roadway illumination is 1.5 ft-candles.

Greer is in the Piedmont area of the State; in 1950, the population was 5060. The Municipal Utilities of Greer, of which Carl C. Lanford is superintendent, provide water, sewerage service and electricity. The electric distribution system operates at 4,160 volts, with 4 wires, 3 phase. Power is purchased wholesale from Duke Power Co., on a demand-energy basis. In 1951, power purchase amounted to $160,628. The combined municipal utilities show a good profit each year; in 1953, the net transferred to surplus, after contributions to the city, amounted to $70,742. The Commission of Public Works, composed of three members, appoint the superintendent and provide general direction of operation. Present members of the Commission are J. S. Paget, H. L. Cunningham and W. A. Fowler.

MAP MAKING FILMS

FILM research studies[1] suggest some major values of motion picture instruction and some examples of these are: "People learn from films; when effective and appropriate films are properly used, people learn more in less time and are better able to retain what they have learned; and instruction films may stimulate other learning activities."

Professor Curtis of Purdue University prefaced his highly informative article[2] on instructional films with the following quote: "Because it strikes the intellect and emotion simultaneously during a period of high concentration, a film can impress knowledge on the mind quicker and be retained longer than most other mediums of instruction".

With these concepts kept in mind and with the knowledge that we are becoming more conscious of the value of training films, this article is presented to acquaint the engineers of our cities, counties and states with the manner of acquiring films pertaining to cartography. Most engineering offices have access to a 16 mm motion picture projector and can make available a darkened room for the projection of these training films.

The sound color motion picture "The Coast & Geodetic Survey," which gives a resumé of the primary functions and activities of that Bureau, is an example of a very worthwhile film. This would be a good film to show to trainees in order to make them more familiar with the different government agencies and their products.

The many government agencies that have motion pictures available are glad to cooperate in furnishing them to engineering outfits. The author will list at the close of this article the names and addresses of the governmental film libraries that can be contacted for the training films mentioned in the following paragraphs. These films can be borrowed by writing to these libraries for the films desired. Shipping charges must be borne by the exhibitor.

The Office of Education was instrumental in promulgating a catalog[3] of U. S. Government films which is most useful to all those interested in utilizing motion pictures, film strips, and slides. Also included is a list of U. S. Government film libraries and sales sources both in Washington, D. C., and elsewhere. The Library of Congress can provide catalog cards[4] on any film released by the U. S. Government and these cards contain a summary, credits, and other pertinent information.

The Coast & Geodetic Survey has two color films available for distribution. The activities film was mentioned previously; the Survey's silent "Geodetic Surveying" film shows field activities of the Division of Geodesy.

The Army Pictorial Service Division at the Pentagon Building and the Central Film Library at Fort Myer, Virginia, will lend prints of any film available. These libraries have copies of training films entitled, "Basic Map Reading" (series of five: TF 5-1788 through TF 5-1792) and "Multiplex Mapping" (TF 5-1546 and TF 5-1549). The "Basic Map Reading" films instruct in the understanding of map symbols and the use of maps. The "Multiplex Mapping" films introduce the principles of the multiplex aeroprojector equipment and demonstrate the Army Map Service methods of topographic map construction with stereophotogrammetric instruments. These educational films compare favorably with the Geological Survey film "Topographic Mapping by Photogrammetric Methods" which features the employment of the multiplex in preparing topographic quadrangles for the Geological Survey mapping program.

Instructional films are available at the library of the Staff Motion Picture Projection Branch of the Department of the Air Force. Among the more pertinent films to be found there are "Highways in the Sky" (TF 1-4803) and the "Basic Map Reading" series (TF 1-4006, TF 1-4007, TF 1-4024 through TF 1-4026). "Highways in the Sky" is an excellent color film showing the procedures used in constructing aeronautical charts. The steps followed include the establishment of ground control, compilation by photogrammetric processes, reproduction, and distribution.

The U. S. Coast Guard has made available "Loran for Ocean Navigation" and "Radar for Navigation". The latter film demonstrates the use of radar by ships entering a harbor.

Another source of motion pictures is the Potomac River Naval Command's film library located at the U. S. Naval Gun Factory. The list covers such subjects as hydrographic surveying, charts, nautical astronomy, aerial map reading and a basic map reading series of four films.

The Map Information Office of the U. S. Geological Survey has training films for limited circulation to groups such as those of the engineering offices in our cities, counties and states. The film "The Helicopter as Aid in Alaska Surveys" is a silent color motion picture. The titles of the sound color films are fully descriptive of their contents which include: Leveling for Topographic Mapping; Transit Traverse for Topographic Mapping; Triangulation for Topographic Mapping; Supplemental Control for Topographic Mapping; and Topographic Mapping by Photogrammetric Methods.

An index[5] covering the list of U. S. Government films for sale by Castle Films of New York can be seen in any library or by contacting the firm for a copy. There is a quarterly "United World's Newsletter" which brings the users of government films up-to-date concerning films released for purchase and use since the last catalogue was published.

This writer suggests that those interested in films other than those made available by the U. S. Government obtain the latest copy of "The Index of Training Films".[6] This publication is a guide to motion pictures and slidefilms which are advantageous for engineering training. This booklet also contains a list of sources where films can be obtained on loan, rented or bought. The safest rule to follow is to order early and to preview thoroughly.

The "Educational Film Guide"[7], an index to over eight thousand 16 mm. motion pictures, is published annu-

HELP TEACH CARTOGRAPHY

by BERNARD J. COLNER

ally with quarterly supplements. This publication is composed of an alphabetic title and subject index and a classified and annotated subject list. Among the films listed in this guide are excellent examples of all aspects of the cartographic field. Following is a list of some of the motion pictures that the author suggests for showing:

Caught Mapping
Airplane Changes our World Map
Global Concepts in Maps
How to Read a Map
Impossible Map
Introduction to Map Projection
Let's Look at Maps
Maps and Their Meaning
Maps and Pioneers
Maps are Fun
What is a Map?
Sport of Orienteering
Maps and their Uses

The author's experience in using these training films to instruct students in surveying has been most gratifying. Many engineering offices have set up training programs to orient their new employees and to bring older ones up-to-date. These very professional films do the job much more ably than most instructors can. Also such films can often be used at public meetings to illustrate some of the work done by public engineering agencies; and some of them can also be used in connection with desirable engineering projects to show the advantages of such works or to illustrate phases of it.

The following is a list of names and addresses of film libraries of U. S. Government films.

U. S. Department of Commerce
Coast and Geodetic Survey
Dept. of Commerce Building, Room 3001
Charts Division
14th Street & Constitution Ave.
Washington 25, D. C.

U. S. Department of Defense
Department of Air Force
Staff Motion Picture Projection Branch
Pentagon Building, Room 5E 216
Washington 25, D. C.

Geological Survey photo

● **TRIANGULATION with a theodolite, using short wave radio for communication.**

U. S. Department of Defense
Department of the Army
Central Film Library
Building 201 North Area
Fort Myer, Va.

U. S. Department of Defense
Department of the Army
Pictorial Service Division
Pentagon Building Room 5B 1066
Washington 25, D. C.

U. S. Department of Interior
Geological Survey
Map Information Office
General Services Administration Building
Room 1038
19th and F Streets, N.W.
Washington 25, D. C.

U. S. Department of the Navy
Potomac River Naval Command
U. S. Naval Gun Factory
11th and N Streets, S.E.
Building 195
Washington 25, D. C.

U. S. Department of Treasury
Coast Guard Headquarters
Public Information Office
1300 E Street, N.W.
Room 1004
Washington 25, D.C.

References

1. "Instruction Film Research 1918-1950", Technical Report No. SDC 269-7-19, Special Devices Center, Port Washington, L. I., New York, p. 9-1.

2. Curtis, Kenneth S., "Audio-Visual Aids in Teaching Surveying and Mapping", 1952, *Surveying and Mapping*, Vol. XIII, No. 2, April-June 1953, pp. 220-225.

3. Reed, Seerley and Wilkins, Virginia, "3434 U. S. Government Films", Bulletin 1951, No. 21, Federal Security Agency, Office of Education. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

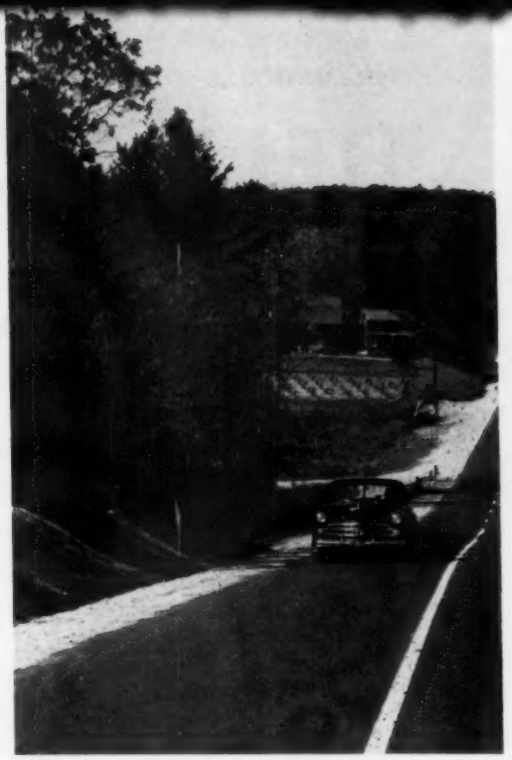
4. Library of Congress, Processing Department, Card Division, Washington 25, D. C.

5. "U. S. Government Films for School and Industry", Castle Films, Division of United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

6. "The Index of Training Films", 157 Erie Street, Chicago 11, Ill.

7. Krahn, Frederic A., Educational Film Guide, The H. W. Wilson Co., 950 University Ave., New York 52, N. Y.

Bituminous Concrete for Secondary Highways



● TYPE "C" bituminous concrete paving on a secondary highway project.

HAROLD E. BESSEY,
State Highway Commission,
Augusta, Maine

SINCE 1950, the Maine State Highway Commission has constructed forty-five miles of secondary highways paved with bituminous concrete. The projects are a part of a seven-year accelerated program to bring 1600 miles of highways to adequate standards by 1956. Previously all pavement on this class of highway was either of the surface treatment or mixed-in-place type, with the exception of a few miles of bituminous macadam. The decision to use bituminous concrete was prompted by the necessity to reduce surface maintenance. As Maine's improved highway mileage increases there is an added burden on the highway dollar for maintenance which threatens to leave the Highway Commission without available funds to continue construction.

On the primary highway system Maine has sections of bituminous concrete paving that have been in use fifteen years. These pavements are still smooth riding, and have not required costly surface maintenance. It is expected that similar results can be obtained on secondary roads. Even ten years without surface maintenance would seem to justify the added original cost.

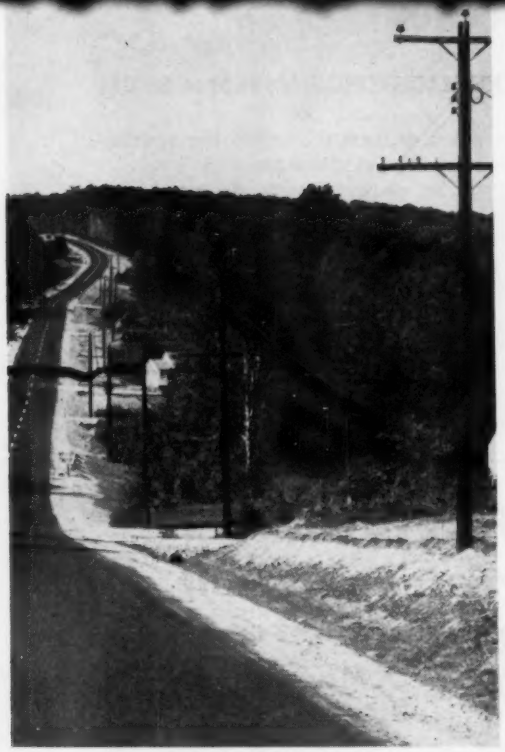
The eleven bituminous concrete secondary projects completed to date range in length from 0.72 to 8.0 miles. Eight firms have held contracts for the work, awarded to them as the result of competitive bidding. The paving, however, has been the work of only three contractors operating hot-top plants in the State. This work was let out to them by the prime contractor as a sub-contract item. Only one project was built and paved by the same organization.

Local aggregates were used in the paving. Ten of the projects were paved with crushed gravel; quarry rock and crusher dust was used on one project. Gravel aggregates are particularly adaptable in Maine as glacial deposits are plentiful, while few sources of suitable trap rock exist. Reductions of from $2 to $4 per ton have been realized on the price of mix by the use of gravel aggregates. The old method was to ship quarry rock by rail, from commercial plants, to sidings near the projects. Bituminous concrete using crushed gravel aggregates was used extensively for airport runways during the war which helped to acquaint engineers and construction men with its use.

A Los Angeles abrasion test with a percent of wear of 40 for 500 revolutions was specified for the coarse aggregate. On one project in order to use a local pegmatite gravel the percent of wear was raised to 44. The gravel was required to be 50 percent crushed.

The completed projects are widely

● PAVING operation in Maine on U.S. Route 202. Note rugged local terrain.



separated across the State. Subgrade soil conditions vary from sandy well-drained wash plains to the treacherous marine clays that overlay a portion of the State. In winter, frost conditions exist that rival any in the United States, alternating from sub-zero freezing to thawing with the free-flowing water of rain and melting snow.

Construction Methods

The Maine projects called for pit-run gravel base to strengthen the subgrade; a 24-inch blanket was used in cuts, and 18 inches on fills. Full gravel shoulders were standard. The gravel base was usually primed with tar for maintenance until the pavement was placed. Traffic was carried on one lane while pavement was placed in the adjacent lane. Where traffic to be carried was light, the prime coat was omitted.

Maine does not specify controlled density of fills on secondary projects. As a substitute the projects are put up for bid in late summer. The heavy fills and much of the base course is then placed during the fall before final freeze-up, and because of this procedure the fills have the benefit of the fall and spring rains as well as the freezing and thawing in winter to aid settlement. All of the projects in the past have included the grading and paving items in the same contract. Future policy calls for holding the paving items over a year or more to allow proper settlement of fills. A 15-mile paving contract covering several adjacent grading and base projects is on the present program.

Results as a whole, in regard to deep fills, have not been discouraging. Deep granular bases placed in dry weather have resulted in some cracking when final settlement was reached. Some cracking also occurred in the vicinity of ledge cuts.

The average daily traffic on the roads on which bituminous concrete pavement was used ranged from 500 to 1500 cars. This type of pavement is planned only on highways where the A.D.T. is 800 cars on sections of the route, or where traffic studies predict that figure soon after the completion of the project. Pavement widths were 20, 22, and 24 feet, with 3 and 4-foot shoulders. Guard rail shoulders were 6 feet to berm.

Five of the projects comprising 26 miles of the paving were on U. S. 202, a route being brought to secondary standards to aid cross-state travel. It is on this route that the 15-mile paving project is programmed.

The projects completed at the present time cost the tax-paying motorist $3,350,000 including right-of-way and engineering. A total of 88,000 tons of mix has been used at an average price of $7.65 per ton. This price includes furnishing aggregates and asphalt cement as well as hauling and placing. The maximum price per ton was $9.10 and the minimum $6.70. The higher price was caused by a long haul. Some of the mix was hauled more than twenty-five miles.

As thickness is a major factor in economical paving with bituminous concrete, the aim was to keep the pavement as thin as possible without sacrificing long service value for the anticipated traffic. In this respect the projects have been a trial and error approach to a problem with results carefully watched.

Table No. 1 shows five combinations of thickness of pavement and number of courses placed. The number of miles of pavement laid down under each combination is also shown.

Table No. 2 lists aggregate gradations and asphalt percentages required, by the specifications, for the bituminous concrete mixes.

TABLE NO. 1—PAVEMENT THICKNESSES AND COURSES LAID

Case number	*Thickness pavement in inches*	*Number of courses*	*Thickness primary course*	*Thickness wearing course*	*Miles paved*
I	1½	1	1½ in.	—	5.37
II	2	2	1	1 ins.	10.43
III	2½	2	1¼	1¼	6.36
IV	3	2	1½	1½	21.21
V	3	2	2	1	1.20

TABLE NO. 2—AGGREGATE GRADATIONS AND ASPHALT PERCENTAGES

U.S. Sieve Size	Type "B" *Wearing & Primary Course* % Passing	Type "C" *Wearing Course* % Passing	Type "C" *Primary Course* % Passing
¾ inch	100	...	100
½ inch	70-88	100	...
No. 4	46-60	35-75	25-40
No. 10	29-45	30-55	18-38
No. 20	...	24-45	15-35
No. 40	10-26	12-40	8-25
No. 80	4-18	7-19	...
No. 200	2-8	3-8	...
Asphalt Cement % by weight of Mineral Agg.	5-7	6-8	4-6½

Pavement on the first ten projects was of Maine Type "B" specification. This mix was used as in Case II to IV inclusive for two-course pavements, and as Case I for a one-course pavement. The contractors used two methods in processing the crushed gravel aggregates and feeding them to the plants. The first method was to crush the aggregates close enough to specifications to make it possible to feed the plant without the use of a blending hopper. Plants capable of rejecting surplus aggregate efficiently, or plants with extra large bin capacity were able to operate with this method. The plants were usually fed with a bulldozer.

The second method, giving without doubt the most satisfactory results, was to separate the sand and stone completely at the crusher. They were then fed to the plant in desired proportions through blending hoppers. Feeding was done by a crane with a clam-shell bucket.

For most projects the fine aggregate from the crushing operation was used for the mix, but at some locations a suitable sand was obtained from a natural deposit. This was necessary where the crushing operation produced an excess of material passing the No. 200 sieve. Where the filler content was below specification the desired percentage was produced by adding a blend of sand.

In most sections of the state, the use of the ¾-inch maximum sized aggregate produced good bituminous concrete. However, where a gravel containing numerous pebbles of a very soft type rock was used the results were not altogether desirable. A soft piece of aggregate imbedded in the mix at the surface of the pavement often breaks under traffic or from winter frost action. The fractured stone then crumbles away exposing a cavity subject to further deterioration.

Type "C" pavement was used, as in Case V, for 1.20 miles, and for 2.10 miles as in Case II during the late summer of 1953. As the stone used was of a very durable type results can not be judged comparatively until this mix is placed at more varied locations.

The bid price for Type "C" mix is about the same as for Type "B" due to compensating items in the production cost.

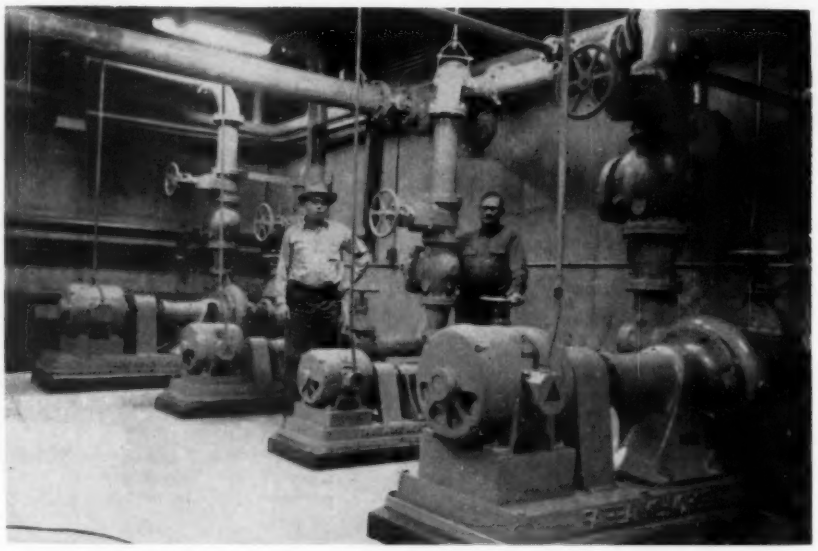
Asphalt cement of penetration grade 85 to 100 was used for all projects.

The mixes were controlled by extractions to check gradation and asphalt content. Densities of samples taken from the rolled pavement ranged from 94 to 98 percent of theoretical maximum.

The continued use of bituminous concrete pavement on Maine secondary projects is well assured by results obtained on the completed projects. Favorable comment by highway users come in from all sections. And as Maine passes the halfway mark of the accelerated program, at least thirty additional miles of such paving are planned.

The projects were designed and constructed under the supervision of engineers of the Maine State Highway Commission; H. Stanley Weymouth, Engineer of Secondary Highways, Sylvester L. Poor, Assistant Engineer of Secondary Highways, and Charles H. Folsom, Civil Engineer II. They were assisted by a staff of engineers and inspectors.

PUMPING FACILITIES
for a Sewage Treatment Plant



● **PUMPS used to deliver sewage to secondary clarifiers and for recirculation.**

REPLACING the first sewage treatment plant built in North Dakota, Minot recently constructed a new plant utilizing trickling filters. The old plant, built in 1919, consisted of an Imhoff tank and also employed trickling filters for secondary treatment. The population, at that time about 8,000, had grown in 1953 to more than 23,000. The new plant includes comminutors, primary clarifiers, trickling filters, secondary settling and digestion.

The sewage from the low areas of the city is picked up in three automatic lift stations and pumped into the trunk sewer. These three lift stations utilize six Fairbanks-Morse pumps with capacities of 350-gpm to 1500-gpm. At the main outfall, another pump station, with three 1500-gpm F-M pumps, discharges through a force main to the treatment plant about a mile distant.

The pumped sewage is passed through two comminutors to a wet well and lifted to 100 ft. diameter primary clarifiers; from these it flows by gravity to the trickling filters and thence to the secondary clarifiers. From the secondary tanks, it is again pumped, this time to the Souris river. For this final pumping, two F-M units are used. One has a capacity of 1500 gpm at 32-ft. tdh and is driven by a 20-hp motor; the other, with a capacity of 750 gpm at 27 ft. tdh, is driven by a 7½-hp motor. The lift from the intake well to the primary clarifier is by four F-M vertical pumps, two of 750 gpm capacity and two of 1500 gpm.

Provision is also made to recirculate sewage from the secondary clarifier back to the primary. Secondary sludge is returned to the intake well. Primary sludge is pumped to the digesters.

Pfeifer & Shultz of Minneapolis were consulting engineers and construction was by Phelps-Drake Co., also of Minneapolis.

VILLAGE OF 16,000 Saves $24,000 *per year* WITH SANITARY FILL

E. J. KNUDSEN

WISE planning by public officials of Melrose Park, Ill., in selecting and maintaining a sanitary fill is effecting a savings of $24,000 a year over other methods of refuse disposal. The basis for this money-saving system was established in 1941 when a 10-acre site, situated on the outskirts of the town and 1¼ miles from its center, was purchased for $12,000.

The site has two distinct advantages: It is located in a low, industrial area alongside a railroad which obscures it from view; and, more important, haul distances from collection areas are short. The village has a population of 16,000, and its president is Andy Frenzel.

Refuse is collected by a fleet of Gar Wood packers—three with 9-yd. capacities and one with an 11-yd. capacity. Collections are made once a week in the residential areas and once daily in the business areas.

To combat rodent, vermin and odor problems, a compacted slag cover is used at the fill. The slag is obtained free of charge from the International Harvester Co. plant less than a mile away, and two of the village's trucks do the hauling. An International Harvester TD24 bulldozer spreads and compacts the slag in 4-in. lifts over 6-ft. layers of refuse. Usually the dozer is able to accomplish this work one morning a week—on Mondays—after which it is transported to do other village work. One attendant is on full-time duty at the fill.

Slag Cover Helps

Results obtained from using the slag cover has paid off handsomely; odors originating from the fill are almost non-existent; rats are no problem because they don't like to burrow through the gritty slag; and fire department records show that its apparatus has been called but once to the fill in the past 12 months, and that for a minor fire.

As the fill is brought up to grade, additional holes are opened to accommodate incoming refuse. This has proved to be a cost-free operation for the village in that a contractor accepts the fill material for doing the excavating. A Homelite pump is set up in the pit to dewater after excessive rains.

Melrose Park's experience can be pointed out as an outstanding example of farsightedness in selecting a sanitary fill site within practical haul distances. Since officials estimate that the saturation point for the fill won't be reached for another 20 years, that farsightedness has certainly been fortunate for the village's taxpayers.

● OPEN PIT at sanitary fill site is dewatered after a heavy rain by a Homelite pump set on a bench part way down.

● ONE OF THE fleet of Gar Wood Load-Packers used by Melrose Park for its municipal refuse collection operations.

WATER DEPARTMENT MAINTENANCE

• • • • A REMARKABLE

GUY BROWNING ARTHUR

WATER maintenance in Los Angeles has its distinctive pattern, determined partly by the sources of water and partly by the nature of the administration. The Department of Water and Power is a self-sustaining department in the city government, a municipal business operating like a private utility.

It pays its way with its earnings, retires bonded debt, and spends about $50,000,000 a year for new water and power construction. It has assets of more than $200,000,000 in the water system. Most important, in comparing it with the typical city water administration, it has power to obligate itself to undertake new projects and issue bonds to pay for them, without review or approval by any other part of the city government.

The gain in operating as an individual agency can be traced through many avenues. The Department can establish rates for service, with the approval of the Council, and these rates are not subject to review by any other agency such as the Public Utilities Commission of California. The present rates have been in force since early in 1942, and out of this revenue the Department carries on its operations and returns some part of the money, at its own discretion, to the city's general fund.

It can carry on a continuing study of water needs and water supply, which is most important in a city of 2,100,000 inhabitants, growing at the rate of 100,000 a year. In 60 years the population has increased 40 times over that of 1890. In the next decade it will gain enough more people to make another city of 1,000,000 inhabitants. To keep pace with the planning for water supply, maintenance must be planned ahead. And while much of the increase will be merely extension of present operations, there are also major shifts to be faced.

● **SERVICE truck is fitted for use throughout the maintenance department. It carries tools and equipment and includes a compressor installed behind the cab.**

The maintenance program cannot stand still when the number and value of building permits double, as in 1952 over 1951. It must grow with a service program which spent $18,000,000 last fiscal year in the following items: New reservoir construction will use $3,000,000; major trunk mains will cost $4,000,000; construction of conduits, pumping plants, stations for chlorinating, and well development will cost $2,000,000; distribution mains, service connections and meters will require $8,000,000; and for general facilities there will be $1,000,000.

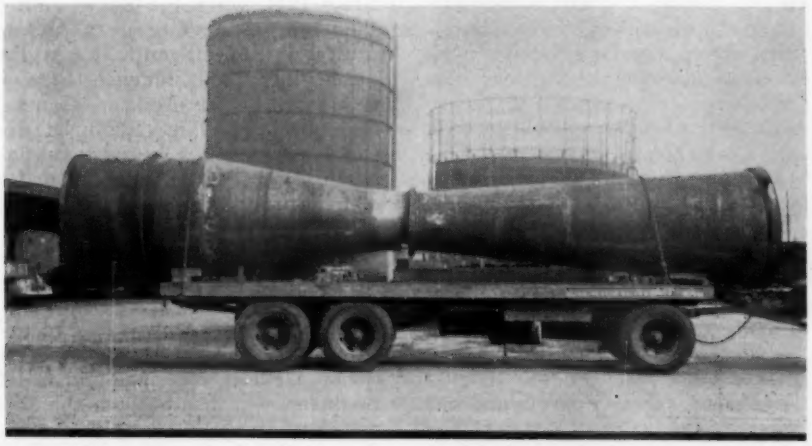
Such figures do not present the scope of the job, for there is no sharp cleavage between on-the-street maintenance and over-all care of the entire system. The two are close together at the first source of water supply, which is pumping from the sub-surface reservoir of the Los Angeles River. This reservoir is behind a natural subterranean dike across the lower end of the San Fernando Valley, just north of the central part of the city. Well drilling and well servicing for this important part of the city supply stand high in the maintenance program. In 1952 this Coastal Plain source supplied a daily average of 79.5 million gallons, or about 21.5 percent of the total, and it is counted on for a minimum safe yield of 65 MGD. It supplied all the city's water until the Owens River project brought water from outside in 1913

Maintenance is separate at the Owens River project, in the high Sierras east of San Francisco and Yosemite National Park. During 1952 the Los Angeles Aqueduct, as this project is called, brought a daily average of 277.9 million gallons, or 75.1 percent of the total. Maintenance is also separate in the operation of the other outside source, Parker Dam on the Colorado River, which supplied, in 1952, 12.5 MGD, or 3.4% of the total.

But when all this water, at 150 gallons per capita, gets to 9 major reservoirs and 84 small reservoirs and tanks, maintenance begins with operations which end at the consumer's tap. The 9 major reservoirs are mostly located right in the city, and stand as beauty spots which cannot be used for any recreational purpose. They are protected from surface drainage, and from contamination by humans, animals and birds.

In the distribution system there are over 5,000 miles of mains ranging from 4 up to 78 ins. in diameter, and 100 miles of pipe smaller than 4-inch. In addition there are 32 miles of conduit. It is necessary to

ASSORTMENT OF ACTIVITIES



● **SPECIAL Venturi meter is 36 ft. long and 72 in. diameter at the ends. This is one of the many items that have been built in the Department's extensive shop.**

lift water at 53 locations, because people seem determined to build houses on the highest hills, above the elevations which can be served by gravity.

The Maintenance Department services 29,917 fire hydrants with the usual checking and repairing. More than 474,400 water services were being maintained at the end of 1952; the total reached the half million mark at the end of 1953.

Maintenance Base

Out of about 3000 employees in the Department, only a small number are used on street maintenance. The crews work from four bases, established for different areas, in much the same way as in other cities.

But here the major part of the work is concentrated in one big yard, rather than dispersed into several yards scattered over the city. This big yard is extraordinary. It is more like a manufacturing plant or huge supply yard. The building is a modern factory structure 460 ft. long by 120 ft. wide, structural steel, skeleton design, giving a maximum of open space. There is a craneway 60 ft. above the floor the full length of the building. The clerestory above the craneway is all glass, bringing surprisingly good natural light into all bays on the floor. On the second floor are spacious offices, with a platform in front from which almost all of the floor activities can be seen.

Floyd M. Clothier is superintendent of shops and equipment, and in that capacity exercises supervision over a remarkable assortment of activities. He has a complete modern machine shop with the best equipment, and also sheet metal, battery, automotive repair, construction equipment, trim, welding, blacksmith, paint and tire shops. All these are housed in various bays of the building. About 255 men are employed here.

Car and Truck Fleet

More than 800 cars and trucks are based here, with a parking and service yard in which airport service trucks carrying 400 gallons of gasoline each serve the equipment with gas and oil. It would be impossible in a base of this size to move all equipment to a pump island for service, taking the time that crews should spend on the job.

● **METER TESTING bench provides facilities for testing an average of 140 small meters at one time. Old meters are checked, rebuilt and tested before resealing.**

In this fleet 498 units are construction equipment. About 300 are cars, 564 are trucks, 9 are buses, and 30 are trailers. The fleet traveled 8,340,184 miles last year.

This yard rents equipment of all kinds to the other city departments, and keeps up its fleet so as to make it adequate for all purposes. For the city as a whole this is an excellent arrangement, providing a cushion for any emergency needs, and concentrating the purchase and maintenance of units, which no one department uses often enough to warrant ownership, in a yard which can furnish them as they are needed. The rentals are on scales similar to those charged by private rental companies.

The Meter Shop

At one end of the building is a meter shop, perfectly equipped and well managed. Big tables for gang testing appear to dominate the space, but behind this section is a large area broken up into booths. Each booth is fitted with a super workbench and submerged tank, with all the tools needed for checking or rebuilding any small meter.

Every new meter is put on the line for testing before it goes out into use. Also, every meter which is brought in is checked, rebuilt if necessary, and tested on the line before it is sealed again for service. About 140 meters on the average, varying for different sizes, are tested at once. These are all small. Special equipment is used for testing up to 10 in.

There are now more than 500,000 meters in service, and there is a backlog of 4000 orders, at least most of the time. About 25,000 are installed each year.

Practically anything can be built in this central shop that might otherwise be contracted to a manufacturing concern. Size is not a limit. For example, one of the men designed the special U-frame for hoisting compressors in and out of the standard service truck. The auxiliary traverse mechanism on the upper arm of the "U" is for leveling the compressor to set it in place or lift it out.

A remarkable job was the construction of 45 10-ft. ring girders for siphons. These were designed in the shop to reinforce the big siphons against possible collapse under vacuum. Made up of segments, they were then cut into halves for bolting around the siphon. This method was necessary to make sure of perfect fitting. The cross-section is a 12-in. H-beam, and the 6 web segments were cut to precision curves with a torch. The flanges were rolled and welded to form complete circles, and then assembled with the webs for welding. Bolting brackets were then welded in place. When all else was finished the rings were cut into halves.

This is one department which still makes its service truck. It is a complete maintenance unit, with a 105-cu. ft. Leroy-Rix air compressor mounted just back of the cab. Drop-down doors, interior cabinets, work benches, pull-out vises, direct-connected air tools, and almost every other item which is common in such trucks, are found in this one.

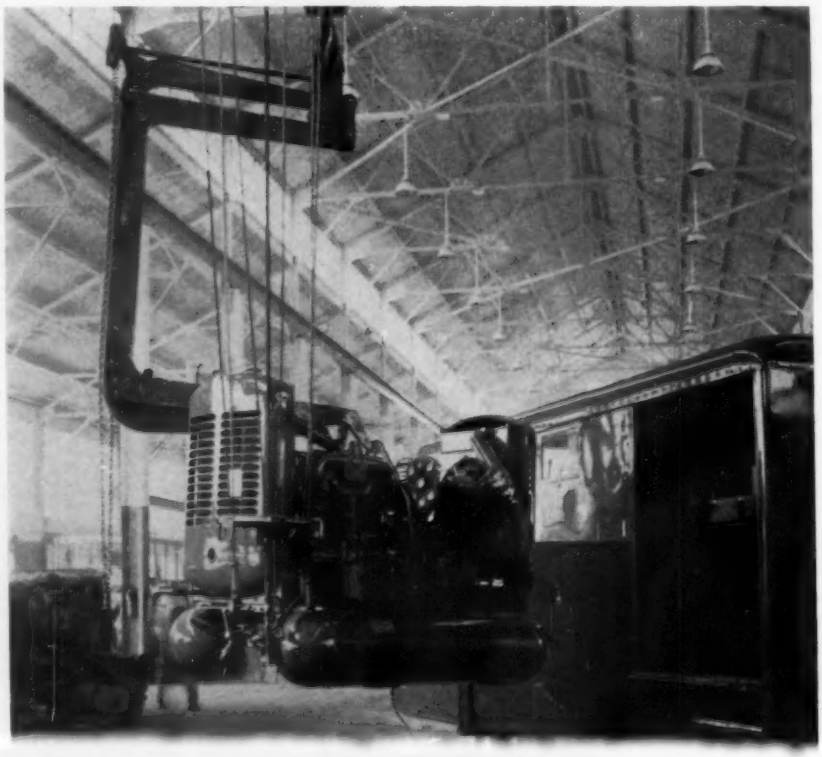
Another maintenance job which tested the capacity of the shop was a special Venturi meter. It was fabricated complete from plate, and was made 36 ft. long and 72 ins. in diameter at the ends, with a 36-inch throat.

Cost Data

For many years the gross and net income of the water department has exceeded its requirements. Some of this revenue is returned to the city's general fund when the Board so pleases. This unusual condition modifies any comparison which can be made between costs in Los Angeles and elsewhere. Maintenance funds are included in such costs, and also in new financing such as the additional projects for 1953-54 for which revenue bonds amounting to $13,000,000 are to be sold. Some idea of the financial set-up is given in these figures for the first nine months of 1953: Operating revenues, $16,576,807; non-operating revenues, $321,569; total income, $16,898,376; operating expenses, without depreciation, $9,524,342; net income before depreciation, $7,374,034; provision for depreciation, $3,336,390; and net income before interest, $4,037,644.

It is notable that the Board of Water and Power sells its management and its service to the public. Since 1944, when the Board gained the right to operate as a private utility, it has diligently taken the public into its confidence. Samuel B. Morris is praised as General Manager and Chief Engineer. He was for some years in the same position in Pasadena, and then for eight years was Dean of the School of Engineering at Stanford University; and he has served on national and state consultative commissions. So he is an excellent figure for good publicity. His two assistants are William S. Peterson, Assistant General Manager and Chief Engineer, who has been in the Department since 1922, and Burton S. Grant, Chief Engineer of Water Works and Assistant Manager, who started in the Department in 1925.

Nothing can sell the Department better than Mr. Morris' affable, poised, and friendly discussion of his problems. In addition, whoever handles public relations knows how a private utility must present its case as an efficient, well managed service.



● **U-FRAME on shop hoist lifts compressors in and out of service trucks.**

SAN DIEGO Chooses Soil-Cement for New Subdivision Streets

SOME forty miles of soil-cement streets in the beautiful new Clairemont subdivision of San Diego, Calif., are now under construction. Completion of these streets will make San Diego the national leader in soil-cement construction with a total of nearly 200 miles of such streets.

The Clairemont subdivision is planned for an ultimate population of 75,000 and will provide housing for 30,000 people early this year. The second largest housing development in California, it is one of San Diego's major answers to the acute housing shortage which long has existed in that city.

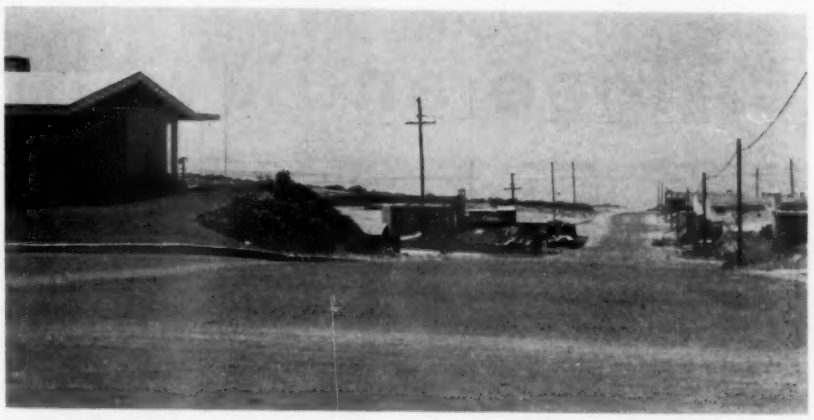
All of the subdivision's streets will be constructed in accordance with the city's residential street standards adopted in 1951. City Engineer, Capt. A. K. Fogg, formerly Public Works Officer for the 11th Naval District, developed the design standards to fit soil, climatic and traffic conditions for San Diego streets. Surfacing and base thicknesses are dependent on physical characteristics of the native subgrade soils, which vary widely in different parts of San Diego.

The standards require a "treated" base 5 ins. thick with a 1½-in. bituminous surface in about 95 percent of the Clairemont area. A few of the more heavily traveled streets are required to be 6-in. soil-cement with a 2-in. bituminous surface. Alleys are required to have a 4½-in. "treated" base with a 1½-in. surface.

The original developers of Clairemont, Burgener-Tavares, selected soil-cement for all of the treated base because it was most economical and because of its fine service record in California.

The record of soil-cement during its short history in San Diego has been particularly impressive. The city's first soil-cement streets were built in 1949. A small program of about 35,000 sq. yd. continued in 1950. In 1951 and 1952 the program expanded to 150,000 and 210,000 sq. yd. respectively. Then in 1953, awards leaped to 1,200,000 sq. yd., of which 835,000 sq. yd. is in the Clairemont development.

Maintenance on the city's soil-cement streets so far has been negligible. Performance of streets built under provisions of the City Engineer's design standards seems to justify his confidence in their ability to assure adequate though low-cost pavements.



● **COMPLETED** soil-cement street in the Clairemont subdivision of San Diego, Calif.

● **DURING** construction rolling follows closely behind placement of soil-cement.

In the Clairemont development, R. E. Hazard Construction Company has subcontracted all street paving, of which over 740,000 sq. yd. has been completed. Construction techniques have varied. Although most soil-cement has been produced by a central mixing plant, road mix methods have been used on part of the work.

Construction Methods

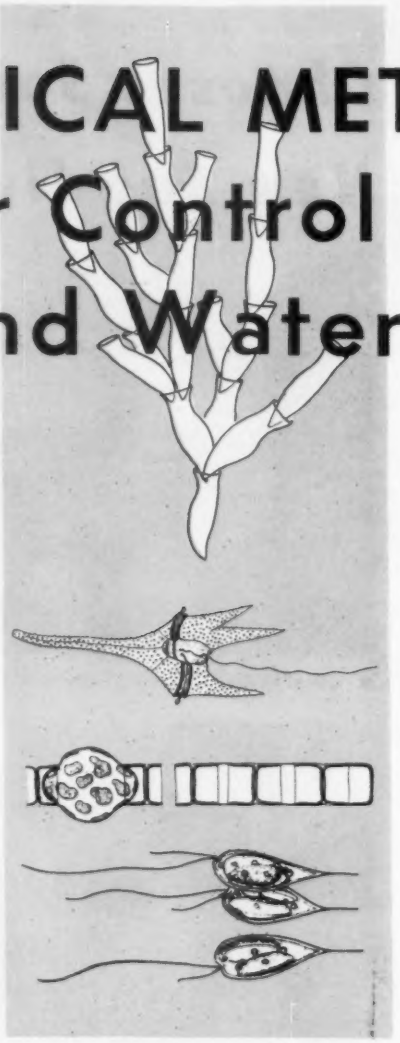
Windrow-type traveling plants mix cement and existing soil on the grade where sandy soils occur. However, native soils over most of the area contain so much clay and boulders that the contractor elected to import nearby sandy loam. A continuous mix asphalt plant has been set up as a stationary plant on the project.

The imported sandy loam, cement and water are mixed and trucked to the streets to be paved. The plant's capacity is 270 tons per hour, enough for about 9,000 sq. yd. of 5-in. thick soil-cement per 8-hr. shift.

All streets are built between curb and gutter. The soil-cement mixture is dumped on the street, spread by graders and compacted by a ten-ton steel-wheeled roller and a pneumatic-tired water truck slightly above the specified grade. The street then is trimmed to final grade by a motor grader. A light spray of water and pneumatic-tire rolling finishes the soil-cement. A light bituminous seal is used for curing.

About 5 percent cement by weight is added to the soil to obtain the specified minimum compressive strength of 450 lb. per sq. in. at 7 days. Optimum moisture is about 9 percent of dry weight.

PRACTICAL METHODS for Control of Algae and Water Weeds



From a paper presented to the Maryland-Delaware Water & Sewage Assn. by Dr. A. F. Bartsch, staff biologist of the U. S. Public Health Service.

EVERY YEAR, increasing energy is being directed toward the control of excessive growths of algae and water weeds. Specific reasons for control vary, but in each case aquatic nuisance control is an attempt to protect or restore water uses that are considered valuable locally.

Algae and water weeds are not necessarily bad, not always a nuisance. They have an important place in the biological world in which we live. But when algae are readily seen or smelled, when water weeds cover the bottom or float on the surface, or when either or both interfere with an important water use, demands for corrective action are made.

The means by which this is to be accomplished varies with the nature of the problem, the geographic area, the existence of restrictive legislation, the equipment at hand, and the knowledge and experience of those doing the work. It is important to recognize that poorly conceived plans and haphazard execution may be more damaging than the aquatic growths they are designed to eliminate.

Characteristics of Algae

Algae growing unattended in natural bodies of water have the ability to convert inorganic materials into energy-bearing foods. For this reason they are important as the starting point of a food progression that ends with fishery products. Fish may feed directly upon these minute plants or may get them indirectly by eating minnows that ate insect larvae that ate water-fleas that ate algae. In either case, fishery products are principally algae, once or more removed.

Nearly all algal difficulties are caused by the ability of algae to grow rapidly and produce dense populations called blooms. Many of the details of how, why, and when algae take off on a growth rampage are not known. It is known, however, that they must have nutrients, ample light, and suitable temperature range.

Water everywhere is a potential culture medium for at least some kinds of algae. Surface waters naturally contain all the kinds of nutrient elements needed for growth, some of which are used only in trace quantities. Waters having more nutrients grow bigger crops of algae, just as fertile farmland grows more grain per acre than less fertile land. Of the various elements necessary to growth, nitrogen and phosphorus have attracted most attention because algal blooms are most frequent and objectionable in hard-water lakes containing abundant supplies of these two elements.

Variations in light intensity, temperature, availability of nutrients, and other changes that come with changing seasons somehow interact to stimulate algae into seasonal spurts of growth. The springtime appearance of diatoms, the summer and fall appearance of blue-green algae, and the reappearance of diatoms in fall and winter are well known to many water works operators.

Excessive algae cause damage in a number of different ways. The seasonal havoc they cause in water works by interfering with filtration is only too well known. Rapid filters which might ordinarily operate for 75 to 100 hours between washes sometimes have filter runs reduced to 2 hours or less. Diatoms such as **Synedra**, **Asterionella**, and **Melosira** are chiefly responsible. Disagreeable tastes and odors frequently accompany excessive algae, apparently as a result of compounds released directly from the algal cells or produced by actinomycetes associated with them.

In many fertile lakes, blooms of algae, especially blue-greens, become so profuse that the water takes on a pea-soup consistency and color. Odors, which at first may be grassy, haylike, and not particularly unpleasant, become especially objectionable when the algae die and decay.

Algal decay in summer sometimes depletes dissolved oxygen resources so that fish die of suffocation. In frozen, snow-covered lakes, respiratory utilization of oxygen by algae themselves may bring about the same end result which is commonly known as "winterkill". Some kinds of algae can kill fish and other animals directly through production of poisons. The "red tide" off Florida, caused by pigmented free-swimming algalike organisms, and mussel

poisoning along the Pacific coast are related phenomena.

These damages demonstrate clearly that algal control is necessary and justifiable under certain conditions. Algae may be controlled either by limiting their unrestricted growth or by killing existing algae. Local circumstances determine which procedure is more desirable.

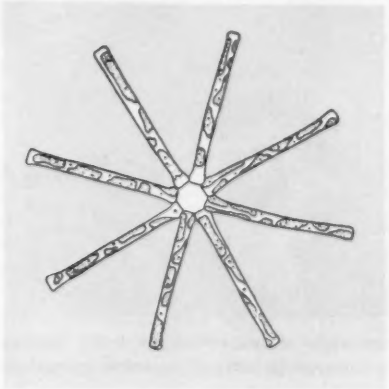
Control by Growth Limitation

When feasible, nuisance growths of algae can be limited or prevented by limiting the area of shallow water in reservoirs, by maintaining high water levels, and by limiting incoming nutrients from soil erosion, irrigation return flows, sewage and treatment plant effluents, certain industries, and other sources. This type of approach is sometimes called biological or ecological control.

Concurrently, research has developed methods for stripping effluents of nitrogen and, more particularly, phosphorus. Effort continues in learning to understand better the various complex factors that determine how lakes respond when fertilized by effluents. As growing population contributes greater quantities of phosphorus to water and as the use of phosphorus-bearing detergents increases, it can be expected that phosphorus removal will be considered more widely as an algal control procedure.

Complete exclusion of light to prevent algal growth is exemplified in the covering of water storage tanks and basins. Partial exclusion of light by induced turbidity has had limited application and this only in the water works field intermittently since 1933. For this purpose, activated carbon is applied to open coagulation and settling basins by bag-dragging, injecting, or pumping to produce a so-called carbon "black-out". Dosage rates of 1 or 2 parts per million once or twice daily on sunny days have proved satisfactory.

● **ASTERIONELLA may clog filters.**



Control by Algicides

Although new commercial algicides continue to appear on the market, practically all large-scale projects in recreational waters involve use of copper sulfate. Experience with this compound dates from 1890 in Europe and from 1904 in America, and its merits and shortcomings are fairly well known. In spite of this, such important factors as the mechanism by which it kills algae, determination of exact necessary dosages, long-term effects upon lake ecology, and inducement of algal tolerance are either unknown or controversial.

Temperature, light, and alkalinity determine the amount of copper sulfate that must be added to water to produce a killing concentration that will persist for a sufficient contact period. Alkalinity is particularly important because of the completeness and rapidity with which soluble copper can be precipitated as a copper carbonate. Undoubtedly, this reaction accounts for much of the variability of success when published dosages for different species are followed. Three developments represent attempts to fit the dosage more accurately to the chemical nature of the water.

One of these is the use of the citrate salt to avoid rapid copper precipitation. A mechanical mixture of sodium citrate and copper sulfate, now on the market, is used chiefly in industrial plants. It is reported to be successful.

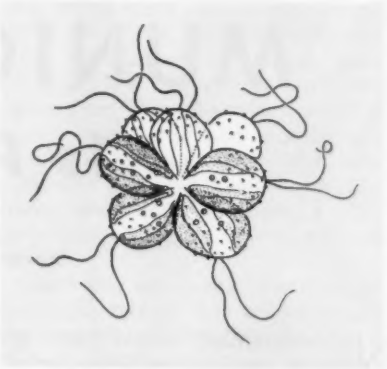
A second approach is the development of a "copper sulfate demand test" to indicate the optimum dosage for the algae in a given water. The test has been used successfully by some but not all persons. There appears at present to be no reasonable chemical explanation for the test reaction.

The third approach is utilization of simple arbitrary dosage rates related to alkalinity. The following have been used successfully in various midwestern lakes for 15 years:

Methyl orange alkalinity<50 ppm =0.3 ppm $CuSO_4 \cdot 5H_2O$ in total volume of water (0.9 pound per acre-foot).

Methyl orange alkalinity>50 ppm =a rate equal to 2 ppm $CuSO_4 \cdot 5H_2O$ in surface foot of water only (5.4 pounds per acre).

Regardless of the equipment used, the principal requirement in treatment is rapid and uniform distribution of the algicide. This is an important requirement, whether the body of water is treated in its surface entirety or only along a marginal zone. Copper sulfate has been applied in many different ways—by bag-dragging, power blowers, aircraft, dry feeders, solution boxes, drippers, sprayers, and by placing crystals on ice. Spray equipment has been widely used because it meets the rapid distribution requirement quite satisfactorily and usually can be assembled conveniently.



● **SYNURA causes tastes and odors.**

During treatment, it is advantageous to spray along successive parallel lanes working from the shoreline outward. In lakes with appreciable alkalinity, rapid formation of copper carbonate gives the treated water a slight milky appearance. This can be used as a guide to avoid additional spraying in areas already covered. Sighting points on shore can be used when treating less alkaline lakes in which a color change does not occur.

To persons experienced in algal control, development of a peculiar and characteristic odor indicates that algae have been affected by treatment. Origin of the odor is not definitely known, but it perhaps is caused by aromatic substances released from cells in the presence of copper. Simultaneously, the algae become faded, and mats of filamentous algae become frothy from trapped gas bubbles. These changes occur within 10 to 20 minutes. Within a day or two the algae largely disappear, and the water is usable again. Duration of relief depends upon a number of factors, varies with different bodies of water, and cannot be predicted exactly. When small lakes are treated in their entirety, one treatment per season usually suffices. If shoreline zones only are treated, several applica-

(*Continued on page* 144)

Rockville Centre, N. Y., has increased the efficiency of its waste collection and disposal operation by making extra revenue through municipal salvage at incinerator site

MUNICIPAL SALVAGE
is Profitable to Us

FRANCIS J. KLAESS,
Superintendent of Public Works, Rockville Centre, L.I., N.Y.

No municipality would burn or throw away money deliberately. Yet I believe many cities and villages may be doing the equivalent of that if they don't engage in salvage as part of their waste collection and disposal operations. Our village has practiced municipal salvage for the last 14 years. Each year we have realized a profit. Salvage hasn't made us any fortune, and our experience has shown that fortunes are impossible in municipal salvage, but salvage has benefited our community both by increasing the efficiency of our waste collection program and by improving our community resources.

Basically, we engage in two kinds of salvage: (1) "Salvage" as the term is commonly used, consisting of the recovery of salable materials, and (2) indirect salvage, a by-product of our disposal, consisting of the reclamation of unusable land by landfill such as is practiced in hundreds of communities. Our village is, I believe, a model for land reclamation, but I also believe that our salvage operation itself is worthy of review by other communities in order to promote greater efficiency in waste collection and disposal.

We first started a program of municipal salvage in 1942, when the demands of World War II forced many salvage operations on the economy of our country. Our salvage program then, as now, was planned and directed by Robert D. Woodcock, our superintendent of sanitation, who long has been interested in the potentials of municipal salvage operations.

Our original salvage program was set up to recover every imaginable item of value, determined by the shortages of war: newspapers, cardboard, rags, carpeting, all metals, glass, and even such items as orange crates, bushel baskets, umbrella frames and felt hats, all of which were salable to private junk dealers. Today, however, we salvage only cardboard, rags, metals, carpets and carpet felts.

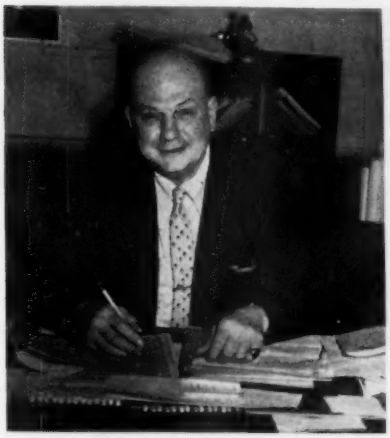
The focal point of our salvage operation is our 50-ton capacity incinerator, which serves our approximately 25,000 people as well as the adjacent Village of Malvern, which pays us $5 a ton for combustible waste disposal. The incinerator, which we built in 1928, was originally designed for manual charging but was later converted to a mechanically charged unit.

Salvage Methods

The actual salvage operation at our incinerator is simplicity itself. Our six Gar Wood Load-Packers and those of the Village of Malvern dump combustibles into the incinerator pit. A continuous conveyor belt at the bottom of the pit carries the refuse to either one of two other conveyor belts which feed into the furnace openings. As the refuse passes along the feeder belts, one or two laborers pick off salvable materials and throw them in piles on the floor below. The material is then collected by the men after the furnaces are charged, bailed in our bailer or boxed, and stored subsequent to sale.

● **GAR WOOD Load-Packer dumps into incinerator pit from which a conveyor belt carries refuse to the salvage point.**

● **CONVEYOR at upper right drops refuse on belts feeding furnace. Worker on platform picks out all salvable materials.**



● MR. KLAESS, Superintendent of Public Works for Rockville Centre, says salvage offers many advantages.

Our profits from the sale of this salvage have been both direct and indirect, depending on the market price of waste paper and scrap. We made a direct monetary profit between 1942 and 1950, grossing as much as $40,000 a year. We have grossed in each of the last few years only about $10,000, which is just above our break-even point now after our expenses are figured for the salvage operation.

We actually make an indirect profit even if we break even, since the two laborers used for, and charged to, salvage also are used on other jobs around the incinerator. We would have to hire extra labor specifically for incinerator operation if we didn't salvage, so we are getting this labor for nothing.

Even though the market for salvaged paper, rags and metal is erratic, ranging from the high prices paid during and after World War II to the recent token prices, our net salvage profit during the 14 years of our salvage program has averaged approximately $10,000 a year. This additional revenue for our sanitation department has easily offset the cost of purchasing modern waste collection equipment like our Load-Packers which give us maximum sanitation and efficiency for our waste collection and disposal operation.

The salvage by-product of our disposal operation, of course, is the land we've been reclaiming. Incinerator ash along with non-combustibles is dumped on marsh land along a river directly behind our incinerator. This otherwise unusable land is being developed as a recreational site for our village. We have reclaimed 20 acres since our incinerator was built and have a nice park and playground built on the site.

Since interest in the potentials of municipal salvage has been mounting because of demands for more efficient waste collection and disposal, I hope that our experiences will be of benefit to other communities. Salvage has paid off for us, so it should be able to pay off for many other communities, too.

Planning a Small Town Water Supply

H. H. MACE, Alfred LeFeber & Associates, Consulting Engineer, Cincinnati, Ohio

TO IMPROVE the water supply of Williamsburg, Ohio, a community of 1700 people, a study was undertaken during the summer of 1954, which had as its purpose to: (1) determine the needs and requirements of the village for water; (2) develop a sound plan for improvement and expansion of the waterworks facilities; (3) prepare estimates of cost; (4) prepare a suggested method of financing; and (5) recommend improvements and extensions to the distribution system.

As a result of the study, it was determined that the cost of the improvements would amount to $276,000, of which $185,000 would be required immediately and the remainder at a later date. Such expenditures represent a major program for a community of this size, but it was possible to develop a reasonable financial program through a moderate increase in the water rates plus a small increase in the tax rate.

With a population of 1700 in 1954, a future growth trend was developed by a study of six Ohio villages in the vicinity, of the same general background with regard to size, industry and geographical location. The six curves were plotted and a composite established which indicated that Williamsburg's population would be 1795 in 1960, 1950 in 1970 and 2100 in 1980.

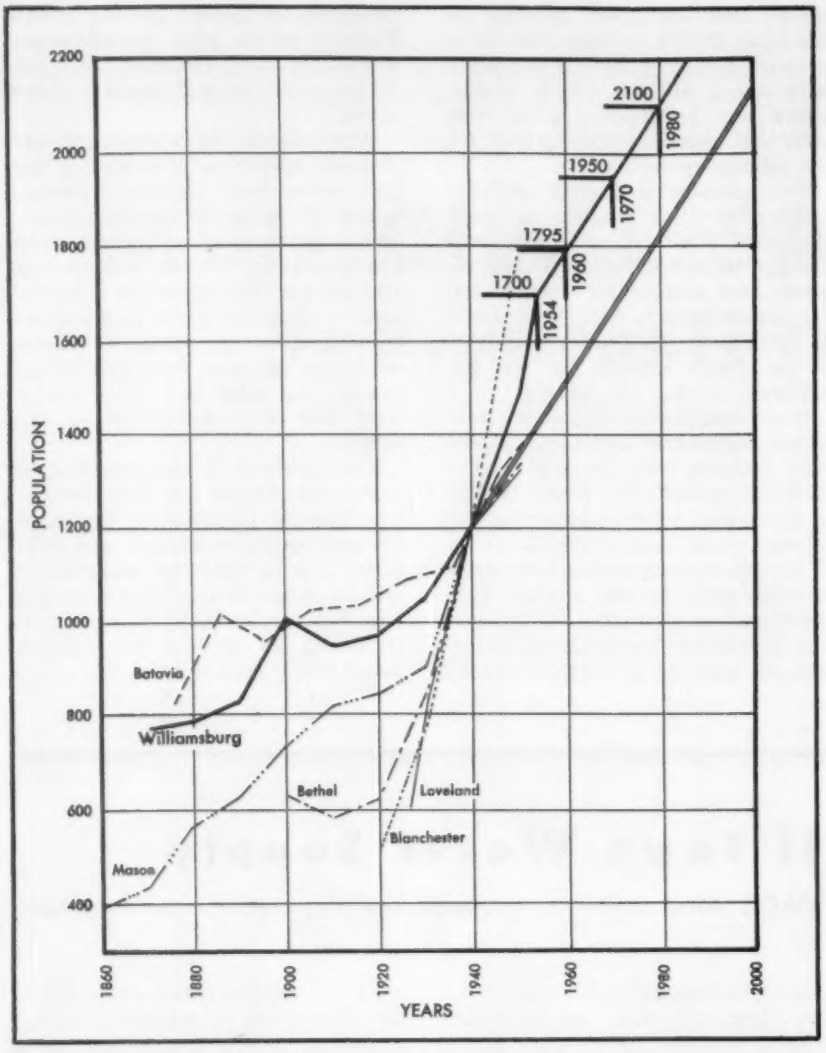
Water Use Study

A study of the water consumption showed a per capita use of about 34 gpd, with a total of 80,000 gallons. The maximum day was 175 percent of the average or 140,000 gals. Assuming that consumption would increase in the future to about 75 gpcd, an overall daily use of 187,600 gallons was developed, this including distribution losses, filter washing, industrial and public use and other consumption.

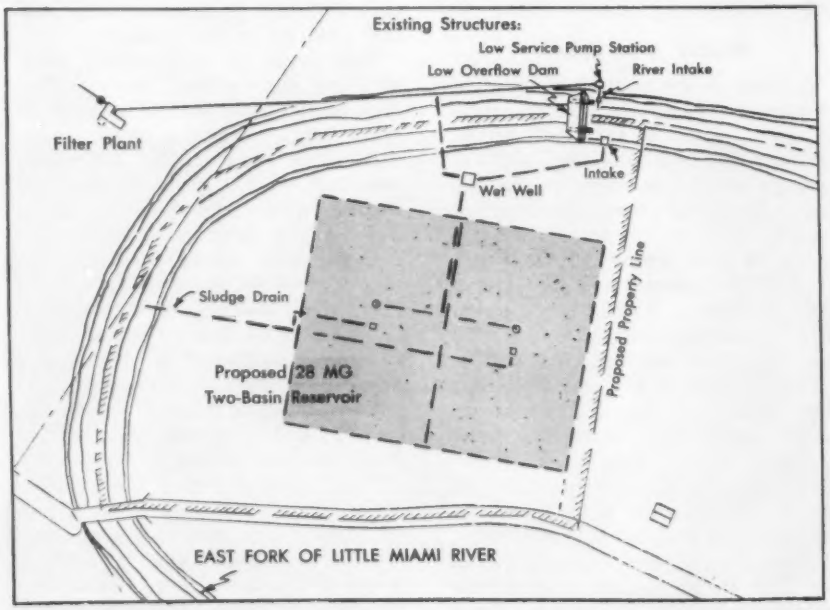
Dry periods in the past have left the Village without water for as much as 163 days. Water has been drawn from the East Fork of the Little Miami River, the flow in which varies from zero to 10,400 cfs. During and for a time after storms, the stream carries much silt. For these various reasons—to provide adequate storage to meet dry weather conditions, to draw water at advantageous times from the stream and to provide presedimentation to remove as much as possible of the suspended matter—it was planned to build a reservoir of an eventual 31.5 million gallons capacity, but to provide only half this capacity at the present.

This could be economically done by using the existing low overflow dam built across the river some 20 years ago (forming a small reservoir) and constructing a storage reservoir on the river flood plain. During higher stages in the river, flow will be directly by gravity to the reservoir, while pumping will be required at lower stages. This plan, which was approved, required, in addition to the reservoir construction, estimated to cost $82,300; a new river intake at $10,700; a raw water pumping station at $16,500; and improvements to the diversion dam to cost $9,500.

The existing rapid sand filter plant has a filtering capacity of 125 gpm. Ferric sulphate and lime are the coagulants and a settling period of 2 hours is provided before filtration. Though the plant has capacity sufficient for many years,



● **FUTURE GROWTH** trend of Williamsburg is plotted to show comparison with other Ohio villages in the vicinity and population increase from two annexed areas.



● **ARRANGEMENT** of the proposed 28 MG two-basin reservoir and relationship with existing structures, as shown in the preliminary report on the water supply.

the filter media was found to be in poor condition, resulting in the need for excessive backwashing. Consequently, replacement of the filter medium is contemplated at a cost of $1000. Other changes recommended at the treatment plant involve a cost of about $700.

Intake and Reservoir Details

Construction of a new river intake will involve a line with two 24-in. sluice gates, with manually cleaned trash racks. The pump house, located near the reservoir, is to have a wet well deep enough so the water will flow to it by gravity from the river. However, with a normal flow of 18 to 24 ins. over the dam, the reservoir will fill one-third full without pumping; thus the pumps need to operate only part of the time. One 1200-gpm and two 275-gpm pumps are planned.

The reservoir is designed on a cut and embankment basis; and one-half is to be built now and the other half when needed. A separate piping system is provided for hydraulic removal of sludge and silt, with discharge into the river below the reservoir.

Water main extensions, to the extent of $35,000, are provided in the plan for immediate construction. For the future in addition to the upland reservoir, an elevated storage tank is recommended.

Costs and Financing

Normal annual operating costs, as of 1954, total $17,233 per year, of which $3,700 are for bond and debt service. It is estimated operating costs will be $19,800 in 1956 and $21,150 in 1968, not including debt charges on the new program. Estimated revenues amount to $31,550 in 1956 and $34,200 in 1968.

To finance the project, it has been recommended that general obligation bonds in the amount of $105,000 and revenue bonds of $91,000 be issued. To cover these bond issues, a new water rate schedule is proposed about 55 percent higher than the present one. Under this, the first 3,000 gallons per month would cost $1.166 per 1000 gallons; the next 3,000 gallons 80 cents per thousand; the third 3,000 gallons 70 cents; the next 6,000 gallons, 60 cents per thousand; and all over 15,000 gals. will cost 45 cents per thousand. Minimum charge would be $3.50 per month. Estimated income on this basis would provide a coverage 1.58 times the charges, leaving a profit each year averaging about $4,600.

CONTROL OF FERTILIZING MINERALS IN SEWAGE PLANT EFFLUENTS

R. L. SMITH, C.E. and WALTER SUBBY, M.D.

THREE recent law-suits relating to the control of the fertilizing minerals in sewage treatment plant effluents cannot help but draw attention to the need for adding additional standards to the present requirements for the protection of public health and stabilization of the organic material. Water conservationists and other biologists have long argued that the present standards for sewage treatment ignore the need for control of the minerals that fertilize lakes and cause excessive algal blooms.

The fifteen or more minerals are inorganic chemicals that are only temporarily adsorbed by micro-organic or plant life and are later returned to solution in the water. In the case of organic material present in sewage, the micro-organic life changes the organic material to a non-objectionable form as a relatively permanent condition. The minerals, in a quiescent body of water are accumulative and can only be removed by removal of the water or by artificial methods.

In the case of where fertilization of lakes has become acute to the point of corrective steps, three solutions have been offered:

(1) The removal of the plant effluent from the lake and transfer to a moving body of water such as a river.

(2) The use of land irrigation by either furrow or over-head spray distribution.

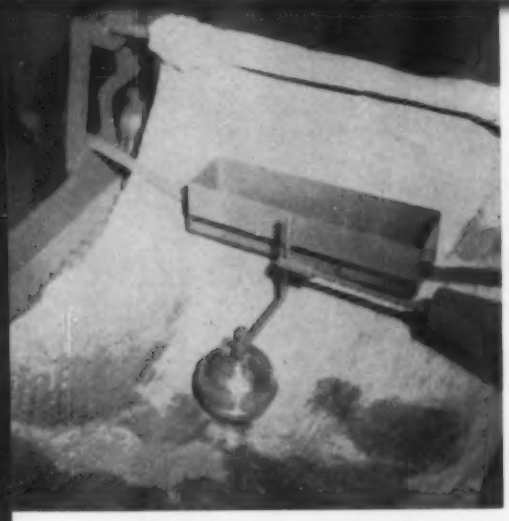
(3) The removal of algae and with the removal of this plant life sufficient of the minerals to destroy the balance of the fertilizing elements.

The removal of the plant effluent from the lake can be an extremely expensive procedure and it does nothing to help a condition of accumulative fertilization of the lake that has already been accomplished. It would appear that, with the other forms of mineral addition to the lake still functioning, this method is pretty much a case of closing the door after the horse is gone. There would appear to be no reason to believe that the excessive algal growth will decrease with time and without artificial help.

The theory of the removal of the minerals by land irrigation, either by the furrow or over-head spray method, is that plant life will adsorb the fertilizing elements. The plant life must be removed from the area before the plant life dies and returns the minerals to the soil. Micro-organic life in the soil will also temporarily adsorb the minerals. The addition of liquid containing the minerals in a quantity beyond the adsorptive capacity of both plant life and micro-organic life will add the minerals to the ground water. The change in location of application of the sewage plant effluent at regular intervals is important in order to prevent this addition to the ground water.

It would appear that a considerable amount of high nitrate water can contaminate the ground water and infect drinking water in private and public wells in the vicinity. If this should occur, there is a reasonable possibility that infants fed on formula made from this high nitrate water might develop a condition known as methomoglobinemia. In this condition, the nitrate is converted to nitrite in the infant's stomach. The nitrite reacts with the hemoglobin of the blood in such a way as to destroy its oxygen carrying capacity. This results in severe anoxemia unless prompt treatment is given. In a reported series, the mortality has been as high as ten percent. This type of high nitrate water implies a concentration of 30 to 100 parts per million compared to the non-concentrated amount of 4 to 6 ppm of nitrate in a sewage plant effluent. The nitrates from irrigation may be added to the ground water in concentrated amounts when plant or micro-organic life is destroyed in the area used for effluent disposal.

● ALGAE accumulation on shore of lake fertilized with sewage effluents.



● PAPER filter removes algae from lake water. As the filtering rate is reduced through build up of organic matter, clean paper feeds from roll at top.

Along these same lines, a similiar disease due to ingestion of nitrates is known to practitioners of veterinary medicine. In animals it usually results from the eating of vegetable matter high in nitrates. It would seem that contaminated water high in nitrate might also be a source of methomoglobinemia in animals. Such diseases have been reported in cows, sheep, horses and goats.

The irrigation solution also has three basic disadvantages in addition to the questionable change of the plant effluent from the lake to the ground water: It is high in cost; it makes no effort to correct the condition created in the lake; and it can create a health hazard for other reasons than nitrate infection.

The removal of algae during the summer months, compared to the other two suggested methods, has certain advantages; first, it will remove the algae and with the algae, the adsorbed minerals; second, it will remove the minerals present in the lake rather than abandon the problem; third, it will permit of the scattering of the removed algae as a fertilizer on land in such amount that there will be no excessive concentrations; fourth, it will eliminate most of the troubles caused by decomposed algae; and fifth, the method is considerably lower in cost than the other two methods.

The mechanics of algae removal consist in passage of the lake water through a paper filter and haulage of the removed algae to a point of disposal on land as fertilizer. The disadvantages of this method lie in the mechanics of passing lake water through a filter. The filter is a relatively light piece of equipment that can be moved but the limit of intake must be about a thousand feet and the unit must be kept from vibrating and must be level. The filter most suitable appears to be a unit having a sheet of paper as the filtering medium, the paper being fed from a roll into the unit, the speed of the paper being determined by the resistance of the paper to the material being filtered, i. e., the movement of the filtering paper being a function of the head of liquid on the filter. In general, the filter is 'trough' shaped with metal sides and the moving paper at the bottom, the paper entering at the top at one end and leaving at the top of the other and after passage over the bottom of the trough. The paper and the filtered solids must be removed together and disposed of by haulage. The filtering of all the water in a large lake would be extremely difficult but normally surface type algae are wind-blown to one side of the lake which reduces the complexity of the problem. The filters are usually set up in 500-gpm units and, on the basis of a reasonably heavy algal growth, have a capacity of about 2½ acres of surface per day. The largest unit available probably approximates 1000 gpm.

In the case of a sewage plant effluent the problem is relatively simple provided it is possible to provide a small lake or lagoon to provide thirty to sixty day's detention of the effluent. A filter at the outlet point will filter the lagoon discharge and return the filtered water to a point down-stream. This procedure, beside providing removal of the majority of the minerals during the summer months, will also provide better sewage treatment.

The filtering of a plant influent to a water treatment plant can normally be accomplished for about one-half the cost of rapid sand filters and will remove probably ninety percent of the algae in the influent.

Limited Headspace Under Pavement Slab Required Use of Arch-Type Sewer

HAVILAND F. REVES

LAYING a new sewer in a developing town area is usually a relatively simple matter of deciding among the competitive materials available for whatever seems best to meet local conditions and cost. But in St. Clair Shores, fast-growing northeastern suburb of Detroit, which runs for miles along the shores of Lake St. Clair, conditions were encountered which required a special application.

On three streets, Yale, Erben and Manhattan, which are about 20 percent built up at the present time, paving was to be installed. The separate sanitary sewers presented no important problem, and this work was done first.

But the storm sewer system received the flow from ditches in the areas adjacent which were still to remain unpaved—and the ditches are shallow here. Wholesale deepening and regrading of the whole ditch system back of this point to meet the requirements of the section to be paved was out of the question.

It was necessary to maintain the specified grade—and still have a storm sewer of sufficient capacity for the projected runoff, in a very flat area, which would fit under the paving slab. The solution was at hand—in Armco Arch Pipe, whose special characteristic shape provided the economy in depth required, combined with a flow capacity to meet the needs of the area.

Approximately 1700 feet were installed, in 15, 18, 21 and 24-inch circular equivalent sizes, according to the requirements of each sewer section. In other sections, where this problem of close tolerance did not occur, concrete pipe of suitable dimension was installed.

It was estimated by Pate and Hirn, engineers on the St. Clair Shores project, that the top of some Armco sections would range only two to six inches under the pavement slab, with a depth available for construction purposes in the project running approximately only two to four feet. Contractor on the project was Larry Petrick of Royal Oak, Mich.

● START of run of arch-type pipe. Note how little cover can be placed.

ADJUSTING MANHOLES in a STREET RESURFACING PROGRAM

W. M. SPANN
Tuttle Ayers Woodward Co.
Civil Engineers

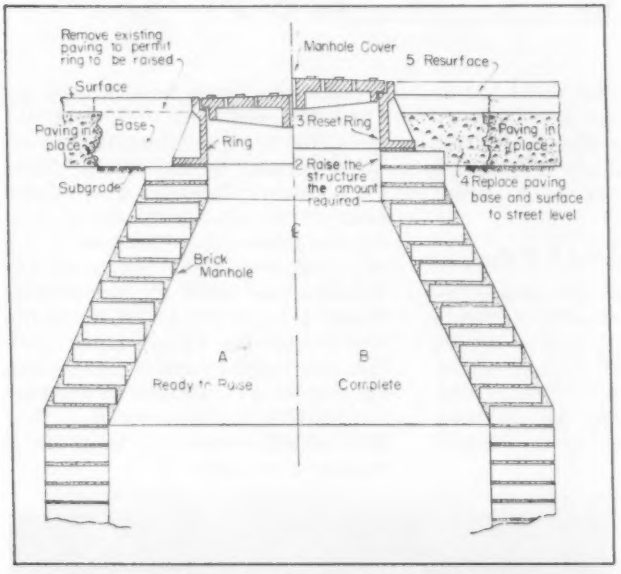
THE smooth flow of traffic on modern streets and trafficways is fundamental to their use and the safety of the people who use them. The increasing volume of traffic has created problems in many communities where roadways, built to fit the economic needs of the past, are now inadequate. These must be modernized or replaced to meet the present day conditions. Many of these old streets have a definite salvage value, and often economy is possible by using the existing pavement as a base for adequate resurfacing.

The preparation of the surface of an existing pavement for use as a base requires a detailed study and analysis of conditions as a preliminary to adequate specifications. One of the important features to consider is that of resetting or adjusting manhole covers, valve boxes, and meter box covers. These manholes or facilities must be adjusted to the level of the proposed new riding surface in order to meet requirements of safety and comfort.

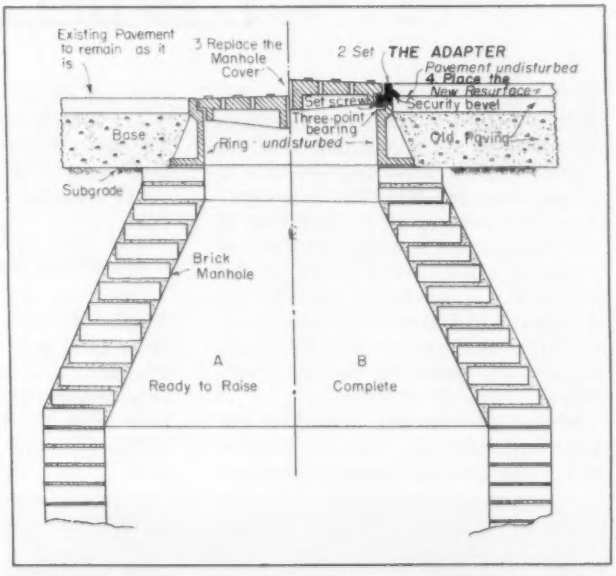
In the past, the usual way to adjust these various covers has been to cut the pavement from around the edge of the castings or rings and then raise the castings to the elevation of the proposed new surface. When this is done, it is then necessary to fill the cavity thus made with new material and to resurface around the casting.

In Figure 1, "A" shows an existing manhole ready to be adjusted, and indicates the paving area to be renewed. "B" shows the adjusted cover as completed. The structure has been raised, the ring and cover have been reset, the paving has been replaced and the resurfacing material added.

The process is slow, expensive and hazardous. Each structure must be barricaded, interfering with traffic movement. The work of breaking the existing pavement around the opening and setting a new base blocks the street area and creates traffic hazards. After the ring has been reset and the base properly prepared, new concrete is poured around the ring, and the repaired area barricaded for at least a 24-hour period. If near a weekend, that part of the street may be blocked for as much as two or three days. Of course, where streets are closed to traffic during resurfacing, the hazards of construction operations are reduced.



● **FIGURE 1, showing ordinary methods of raising manhole frames by cutting pavement and rebuilding top of structure.**



● **FIGURE 2, by comparison, shows how Manhole Adapter may be used during resurfacing to avoid cutting old pavement.**

The cost of this method of procedure may range from $50 to $100 for each major opening; and this does not include values that may be placed on such factors as breakage of existing manholes or possible weaknesses caused by disturbing the basic foundation of the street.

We have found that the "Manhole Adapter" serves the purposes of safety, economy and better construction procedures. It is applicable for the adjustment of all facilities involved, and can be made available for manholes, valve boxes and meter box covers. This adapter is a "tailormade" device and can be designed for any size or shape of

street opening. Varying elevations are also provided for through the production of different height patterns.

Figure 2 illustrates the principles involved. "A" shows the existing condition—nothing is disturbed to weaken the base. The procedure is simple: The manhole cover is removed just prior to the resurfacing operation; the ring is placed and rotated on its three-point bearing to slot firmly without rocking; the Allen Studs are tightened to fasten it in place; and the cover replaced. These operations take only a few minutes.

The resurfacing material is then placed around the ring to the required depth and rolled for compaction. The beveled edge on the ring, an important feature, extends under the new pavement surface, making the extension unit or adapter an integral part of the facility. The assembly is as strong as it was originally, without possibility of rattle or movement. The street is usable in the process of resurfacing. There are no delays in going ahead with construction or resurfacing operations. The cost is an average of less than one-half the average costs of raising the manhole itself.

The adapter has an additional potential value. If and when the street has been repeatedly resurfaced to the point where the surface is curb-high, it may become desirable to remove some of the old surface material in order to lower the surface to a satisfactory grade. The castings can be lowered to the new level, without cost or delay if adapters have been used.

Incandescent Lighting for New Florida Expressway

THE opening of a four-mile, six-lane highway from the northern limits of Fort Lauderdale, Fla., to the downtown area was recently a cause for celebration. The new highway is a part of U. S. Highway 1, and replaces an antiquated two-lane highway, a bottleneck for the heavy traffic in that section of Florida. An outstanding feature of the new highway is a modern white-way lighting system, built at a cost of $115,000.

Above the Gateway, which is the term applied to the northern section of the city near its limits, the system consists of 100 double units 120 ft. apart, which are placed in the center strip. Below the Gateway in the city proper there are 128 single units staggered 75 ft. apart on the curb.

Surface Intensity 0.8 f-c

Designed for a street surface intensity of 0.80 foot-candle, the lights have been producing that or better. The same system will be used on the new South Causeway, which will lead from U. S. 1 in the southern section of the city to the beach area.

Luminaires were furnished by the Line Material Co. Poles are the Octaflute type, aluminum painted, manufactured by the Union Metal Co. Lowry Electric Co., Coral Gables, Fla., was the electrical contractor under the direction of the city engineer, E. L. Patterson. Inspection was made by the Florida Power & Light Co. All wiring in the city limits was underground. Both mercury vapor and incandescent lighting were considered by the Fort Lauderdale City Commission, but the final selection was in favor of the incandescent lights.

● **LIGHTING standards on U. S. Highway 1 in Fort Lauderdale. These single units are staggered 75 ft. apart on curb.**

● **THE SAME scene at night. These units are located at the Gateway Cloverleaf which is near the northern city line.**

● **ELBOW constructed with liner plates is at top right. Plates were specially fabricated at shop to fit bend.**

Tunneling Under Railroad Lines to Reach Treatment Plant

AN interesting aspect of a recent $2,350,000 sewerage construction program in Jeffersonville, Indiana, was bringing two combined sewers under a double track railroad to the sewage treatment plant. Each line is about 350 feet long; one 27 inches in diameter and the other 90 inches. Fills range up to 43 feet for the smaller line and 37 feet for the larger line. The large diameter line was installed by tunneling with Armco galvanized and bituminous coated tunnel liner plates with a field-applied asphaltic invert pavement. These plates serve as both tunnel casing and carrier pipe. The smaller line consists of Armco 36-in. diameter corrugated casing, jacked in place, with a 27-in. diameter Asbestos-Bonded coated and paved carrier pipe threaded inside. The liner plates included a shop-fabricated elbow.

This tunnel was a part of a storm sewer improvement and extension program to eliminate flooding of streets and basements caused by an old and inadequate system. It also will provide service to newly annexed areas. The tunnel carries storm waters under earth-elevated tracks of the Big Four railroad and a spur line of the B&O railroad. About 30 feet of the entire 350 feet was open-cut. Installation required ten weeks and cost approximately $30,000.

Goodwin Construction Company of Jeffersonville was the contractor for the tunnel work, which was done under the supervision of William Goyne, City Engineer. Armco Construction Service was the sub-contractor.

● **EXCAVATING ahead of the tunnel, which will angle to the right. About 30 feet of construction was in open cut.**

● **HANGING top plates in open cut section. This line is 90 inches in diameter and will serve as the carrier pipe.**

MODERNIZING a 38-Year Old Bridge

C. LELAND WOOD

City Manager, Watertown, N. Y.

THE multiple arch concrete highway bridge over the Black River in Watertown, forming the extension of Van Duzee St., was built in 1916 at a total cost of $30,298. It has 5 arches of 62½ ft. clear span and the axes of the arches are on a 50° angle with the bridge centerline. With a total length of 372½ ft., there was an 18-ft. roadway and a 5-ft. sidewalk.

As traffic increased in volume, modernization of this important bridge became necessary, and it was recommended that the City Council provide funds for the work. The City Engineering Department prepared plans. These provided that the sidewalk, and a water main carried underneath, be supported on structural steel brackets attached to the upstream side of the bridge. Funds were provided by part of a bond issue which included other projects.

Proposals were received last spring, the lowest bid being $41,143.50 which included $1500 for maintaining traffic. The contract was awarded to a local contractor. It is interesting to note that the original cost of the bridge was less than the comparatively small modernization project undertaken 38 years later.

The bridge lighting system, consisting of 12 ornamental standards supported on top of the concrete parapets, was in need of repairs and could not be replaced by modern units in the same location. Four new higher standards were located along the new sidewalk next to the parapet, resulting in a much better distribution of light. The change in lighting system was under separate contract and cost $2700.

The 12 old light standards carried 1000-lumen lamps 9 ft. 5 ins. to the light center above the parapets, which are 52 ins. high. The new standards were furnished by the Union Metal Mfg. Co., and are of the fluted metal type with 6000-lumen lamps 25 ft. 5 ins. above the base of the parapet. These are supported on metal plates welded to the top of the I-beams forming the sidewalk brackets. The new lighting system was installed by the Donovan Construction Co. which has the contract to operate and maintain the municipal electric distribution system.

The general contractor removed the old sidewalk and water main first, then excavated so that holes for the top members of the brackets could be cut in the spandrel wall. In drilling through the wall at various points, slow progress was made due to the excellent quality of the concrete encountered.

The bracket members were placed in proper position, encased in concrete for anchorage, and the openings in the spandrel wall closed. New pavement was then placed. The easier flow of vehicular traffic due to the increased pavement width has been much appreciated by our citizens.

At the northerly end of the bridge there was a slight grade on a curve at the approach. Realignment of the roadway at the approach to the bridge was made to reduce traffic hazards. A small amount of gravel fill was placed to make an easier grade at this end of the structures and serve as a base for the new

● **AFTER the old sidewalk was cut away the water main beneath could be removed. Here workmen remove original form lumber which had been placed under the sidewalk.**

● **STRUCTURAL** steel brackets pass through openings in spandrel walls and are anchored by concrete encasement.

main. The other longitudinal space will be used to support a new gas main. An open grating type of sidewalk was adopted to save weight and to eliminate the necessity of snow removal in the winter.

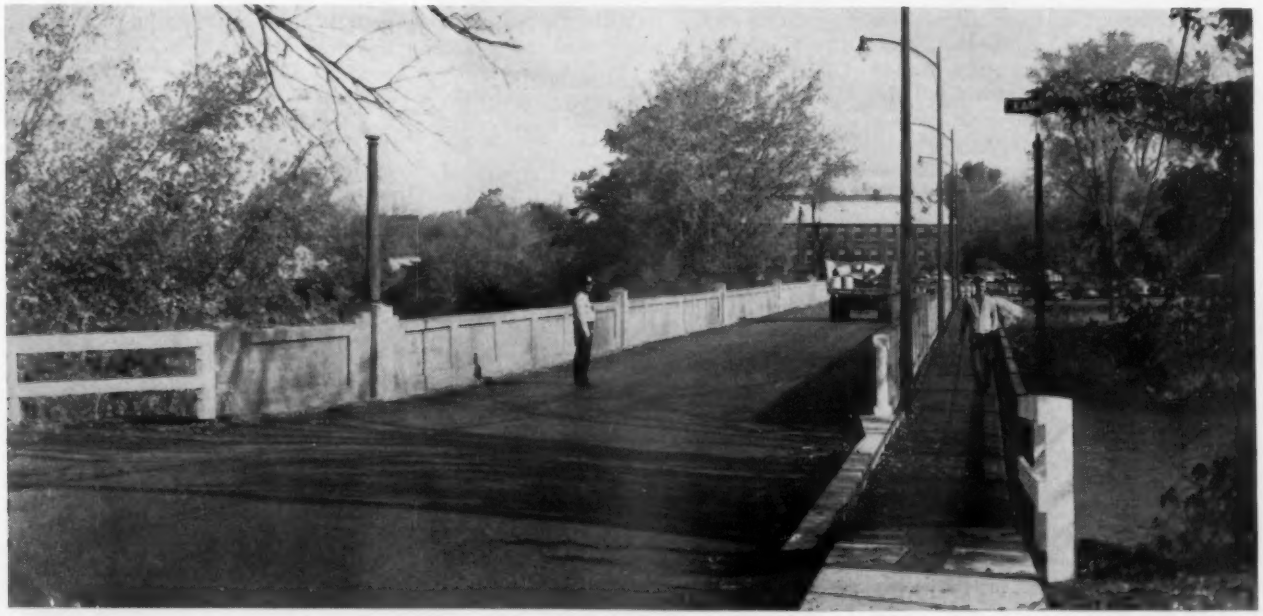
The 10-inch water main is supported by wood saddles fastened on top of the brackets. After the pre-moulded insulating material was placed, it was wrapped with a 90-pound asphaltic roofing felt to provide protection for the pipe covering. No. 12 gage galvanized metal sheets were wired on the top one-half of the water main for additional protection against objects which might fall through the sidewalk grating.

● **LONGITUDINAL** beams provide space for water and gas main. Note bed blocks shown in picture below.

pavement. The catch basins along the old curb were left intact and the new pavement under the original sidewalk placed to slope down to the former gutter line.

Longitudinal beams were placed on the brackets. One line supports the outer edge of the open grating sidewalk and iron rail; the other two support the inner edge and the center of the new walk. The space between the center beam and the inner one serves the relocated water

● **COMPLETED** job, with old-type light standard placed at left for comparison with the modern installation at right.



DIESEL POWER SUPPLEMENTS STEAM POWER PLANT

RALPH L. YANISH, Borough Manager, Quakertown, Pa.

PROVISION of additional production capacity at the Quakertown, Pa., Municipal Electric Plant became acute about two years ago. Local electric usage had increased over 60 percent in the preceding four years; as a result, equipment installed in 1948 was being used practically to full capacity. This equipment, a 40,000-lb. boiler and a 3,000 KW generator, supplemented equipment installed previously with a capacity of 46,000 lbs. of steam and 3,000 KW.

The equipment installed in 1948 was in excellent condition, but was inadequate to meet the demands which had increased to 3200 KW. Because of exceptionally hard use in the past, all of the older equipment was badly in need of major rehabilitation. The load situation in 1952 was such that two boilers and frequently two generators had to be used to meet peak requirements of four hours or more. This arrangement proved very uneconomical from an operating standpoint and in addition precluded the possibility of arranging to repair the old equipment.

The solution to the problem was greatly complicated by restrictive State Legislation which grants municipalities with electric plants the same percentage of borrowing capacity as Boroughs without electric, water or sewer systems. Since the greater part of Quakertown's borrowing capacity had already been used to finance sewer plant improvements, this meant that the only way improvements could be financed would be through operating profits. Despite the fact that our annual operating surplus usually exceeds $100,000, this restrictive Legislation limited to a great extent the type betterments which the Borough could finance.

Leaving the question of finances momentarily, there appeared to be three possible approaches insofar as the technical solution of the problem was concerned. This would have involved either of the following:

(a) Install a new 60,000-lb. boiler and a 5,000 KW turbo-generator.

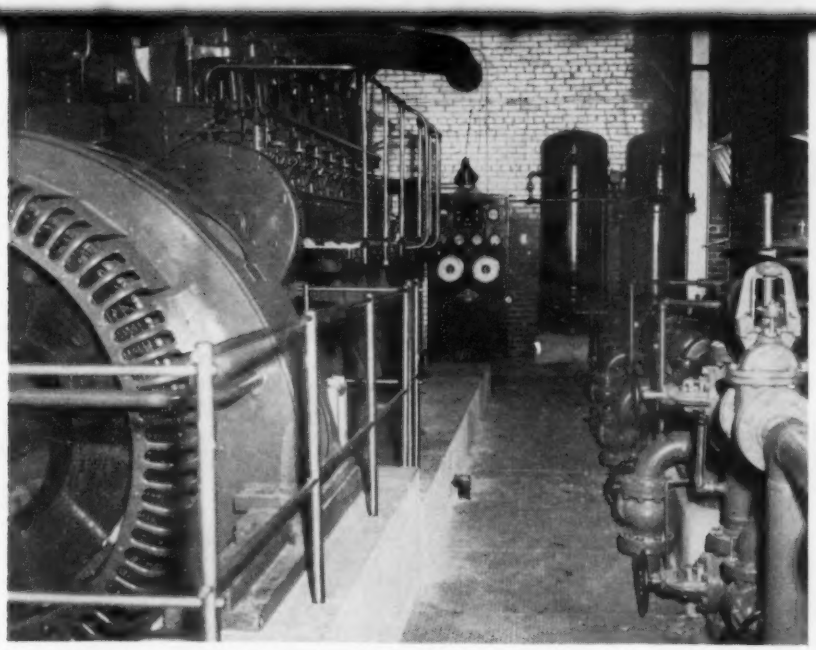
(b) Purchase power from private utilities.

(c) Install a 1000 to 1200 KW diesel generator unit and utilize it for peaking and standby purposes.

If a new boiler and turbo-generator had been decided upon, it was felt that a boiler of at least 60,000 lbs./hr. capacity would be required with a 5,000 KW generator. Based on prices quoted to us at that time, a boiler and stoker of the type noted would have cost $200,000. Building additions to include changes in coal and ash-handling equipment, air supply and contingencies would have cost an additional $150,000 or a total of $350,000. As an alternate, the Borough studied the problem of removing one of the old boilers and replacing it with a new unit. Such a change would have cost $275,000 and in addition we would have had to contract for at least 1500 KW in standby power which would have cost the Borough about $30,000 per year for some eighteen months during alterations.

While our present boilers operate at 250 lbs. pressure, a new boiler should preferably be of the high pressure type to secure added efficiency. If this were done it would have been desirable to change our remaining equipment to high pressure operation. This would have cost at least $30,000. Consequently, the addition of new boiler equipment of adequate size would have cost somewhere between $350,000 and $400,000. The Borough would also have been required to install additional cooling capacity, the cost of which would have exceeded $100,000. In addition the Council would have had to replace the existing 1,000 KW generator with one of about 5,000 KW capacity which would have cost at

● MUNICIPAL power plant serving Quakertown. New Diesel generator has reduced the cost of power generation.



● **DIESEL ENGINE and auxiliaries are compactly arranged to facilitate operation and maintenance. Baldwin-Lima-Hamilton engine and generator rating is 1100 KW.**

least $300,000 more. Taking all these requirements into consideration, we estimated a total cost of $800,000 if the new equipment were installed in the existing building with separate auxiliaries.

The use of additional steam equipment had the important advantage of offering lower production costs since with high pressure steam, it was felt our bus bar costs could be reduced by at least 25 percent. Unfortunately the Borough's financial situation was such that there was no possibility of acquiring such equipment except on a "lease basis." This possibility was complicated by the question as to whether the Borough could legally acquire such property in that manner. Another deterrent to the plan was the unusually long time required to make delivery.

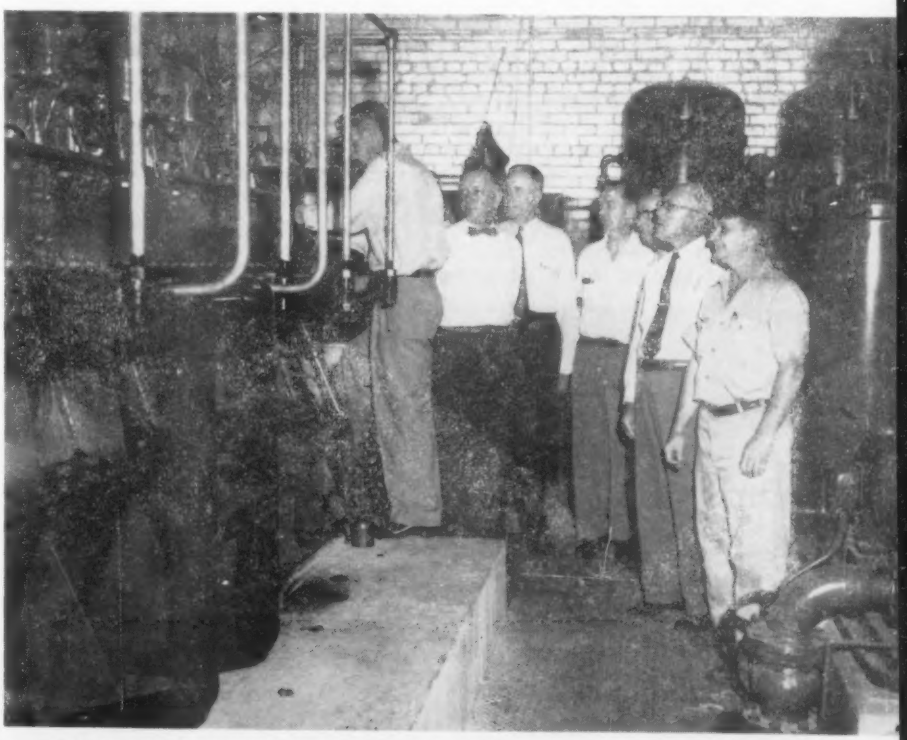
Borough officials investigated and gave serious consideration to the possibility of purchasing power from nearby power companies. Only one company offered to make this service available and submitted a reasonable proposal insofar as construction costs were concerned. Their offer contemplated building the necessary transmission line to the Borough limits without cost provided the Borough would construct a sub-station and tie line to the plant. These changes would have cost the Borough about $20,000 if we contracted for 400 KW, or $40,000 if provision was made to take up to 1500 KW.

The disadvantage of this plan was the relatively high costs the Borough would have had to pay for power. For example, if the Council contracted for 400 to 500 KW in firm power, the average cost would have been 1.9c per KWH. On the other hand, if the Council contracted for 400 KW for standby and did not use it all during the year, the charge would have been $1600 per month or over $19,000 per year. If it had purchased 1,000 KW in firm power, the difference between Quakertown's then existing cost of production and the charges billed would have exceeded $30,000 annually. This figure is particularly pertinent in that it would be more than ample to amortize the diesel equipment then being studied for possible purchase.

The third possibility involved the installation of a diesel generating unit. When this possibility was discussed with a number of local engineering consultants, the writer was surprised to find that many felt that diesel equipment could not be successfully synchronized with steam equipment. We should like to take this opportunity to eliminate once and for all this mistaken impression since it might be deterring other smaller municipalities from this step. We should like to temper this statement by pointing out that we are well aware that different conditions at other locations might make such an installation undesirable. In our particular case this equipment had definite advantages. It could be put into operation on a few moments notice and was especially adaptable for peaking and standby purposes. Most important, its first cost was considerably less than steam equipment and within our ability to pay, while operating costs were estimated as being about the same.

Preliminary estimates secured from manufacturers indicated that a new diesel of a 1,000 KW capacity would cost about $200,000 including all auxiliaries excepting the building. A used and rebuilt

(*Continued on page* 150)



● **CITY OFFICIALS, electric plant personnel and representatives of the engine manufacturer look on as the new diesel unit was put in service in April, 1954.**

● MARKING crosswalks in Atlanta. Traffic can pass safely over the fresh lines.

VEON *Crosswalk Markings for Atlanta*

AN EXTENSIVE program for marking crosswalk safety lines began recently in Atlanta, Georgia, when the city issued a contract to lay 28,000 feet of 4-inch crosswalk lines at school and downtown crossings. The material being used for these markings is Veon, a thermoplastic compound which is applied by means of an automatic, electrically controlled one-man machine. Prior to issuing the contract, traffic engineers for Atlanta had observed the results of demonstration lines placed by Veon field engineers some months before.

Veon possesses a number of unusual characteristics which make it especially well suited for crosswalk marking use. Extruded hot from the automatic machine, it dries almost instantly on contact with the street surface. Thus there is no need to halt the flow of traffic at an intersection for more than a normal 90-second traffic light cycle. No special preparation of the road surface other than ordinary broom cleaning is required. Lines may be applied directly to freshly placed asphalt or concrete, and with a simple attachment clean lines can be placed on cobblestone streets. Veon is available in non-fading white, yellow and red. The colors will stay bright through its lifetime, said to be five times that of paint, through the "erasing" action of tires which rub off accumulated dirt as they pass over the lines.

Equipment for laying crosswalk marking of this material is available through local Veon dealers, and may be leased by municipalities or private contractors for a nominal charge. The equipment can be furnished, completely installed and ready for use, in a small panel truck or on a 2-wheel trailer. The thermoplastic compound is sold by the pound and is packaged and shipped in 50-lb. cone-shaped aluminum containers which are placed directly on the line marking machine. No mixing or other preparation is necessary since the machine both heats the Veon to the controlled temperature and applies the line from the container. Veon lines are 3/32″ to 1/8″ thick; approximately three linear feet of 4″ wide line can be expected from each pound of material. One man can efficiently operate the light weight machine, which will lay 2,000 feet of 4″ crosswalk line in a day.

The cost of Veon lines, though higher than paint initially, permits an estimated dollar saving of 40 percent on complete installation and maintenance costs when computed over a three-year period. Tests on the product have been conducted in accelerated traffic areas during the past five years.

The crosswalk marking program for Atlanta, largest of the cities in the Southeastern section of the nation to use this new material, was started in December. The work was done under contract by J. W. Goldsmith Company, distributors of Veon in Georgia, Florida and adjacent areas. Karl Bevins is Atlanta's traffic engineer.

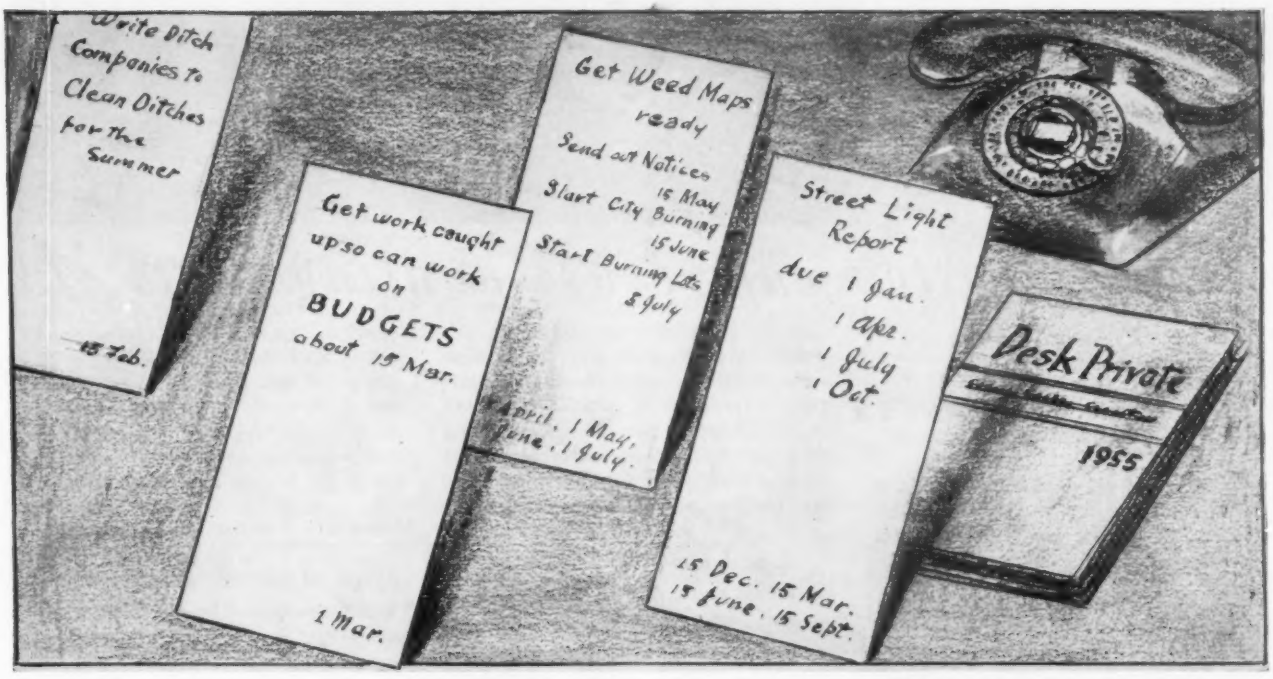
● UNITS used as mobile demonstrator include all equipment that is required.

● COMPACT application machine has automatic temperature control.

Keeping Account

OF THOSE RECURRING JOBS

J. L. MORRIS, City Engineer, Boise, Ida.



THE City Engineer, like many other officials, has several jobs each year that must be done on schedule. Some of the jobs might be assessment rolls for the summer's work; a street light report every three months; a month's advance warning of an expected high water period; the wife's birthday; or annual bills for maintenance and leases. Whatever the event, you don't want to forget it and it should be done on time. In fact, there is nothing that gives quite the satisfaction as having a job half done by the time someone else thinks of it!

How to keep ahead of those jobs with the least effort was the goal. After trying the obvious methods of memory and writing in a calendar, the final result was a series of separate notes, which slip inside a desk calendar pad, or a diary or appointment book. The notes are written on colored paper so they stand out. They contain the instructions, a date to start on the project or perhaps a completion date, and a date on the bottom showing where to place the slip in the calendar, usually a few days before any action is required.

These notes save much writing and rewriting in the calendar pad. Also, if you cannot start the job the day the notice turns up, just move the slip to the next day. If the action is required, for example, on a report every three months, after the report is made for one period, move the slip to the next reporting date. When action has been completed for the year on a job, move the slip to the back of the calendar pad; by the end of the year all the slips are there. At the beginning of a new year, glance at the date on the bottom of the note and it takes only a few minutes to distribute them through the new calendar pad.

Hurricane Damages R. I. Sewage Treatment Plants

Included among the damages by Hurricane Carol on August 31 were several Rhode Island sewage treatment plants located near tide water. Because these plants were inoperative for one to four weeks afterward, it was necessary temporarily to close shellfishing to a large area of Narragansett Bay, according to reports by the New England Interstate Water Pollution Control Commission.

Damage to electrical equipment at the Bucklin treatment plant by flooding amounted to $25,000. Inundation of pumping stations at Bristol resulted in damage of $17,839. At East Providence flood damage to pumping stations and secondary treatment units reached a total of $137,678. The secondary settling tanks and aeration tanks at the Providence plant were flooded. An estimate of the expense of repairing the damage is not yet available. The Warren sewage treatment plant and three pumping stations were inundated resulting in damage amounting to $13,265. Flood damage to the sewage treatment plant and sewer system amounting to $8,328 was experienced at the town of Narragansett. Minor flood damage to the sewerage systems in Cranston, East Greenwich, Jamestown, Pawtucket, Westerly and West Warwick, totaled $3,975.

With their short wheel-base, Load-Packers maneuver easily in narrow alleys, drive safely through traffic, turn quickly at the dump. Pictured unit is one of eight used by Anthony J. Ryan, Inc. in their district of Boston.

How Boston cut refuse hauling costs 1/3

With its dense population and extensive area, Boston, tenth largest U.S. city, faces a tremendous refuse-disposal problem.

As central areas become filled, waste must be trucked longer and longer distances to locations outside the ring of suburbs surrounding the city. Until recently, the

Another way Boston plans to reduce refuse disposal costs is by building incinerators. Commissioner of Public Works, George G. Hyland, points to site of the city's first such unit. When completed its 750-ton capacity will eliminate need for two dumps, and will save the city $250,000 a year. In 1954, Boston paid $2,600,000 (about $3.25 per person) to dispose of 310,000 tons of waste.

cost of sanitary service grew steadily. In one typical district (population: 68,000) *expenses rose 70%—$7,000 a month for trucking alone,* when closing a nearby dump made longer hauls necessary. The use of open trucks made the problem even more serious. Because they could carry an average of only 3400 lbs. per load—despite an average bulk of 12½ cubic yards—crews had to spend a large part of their work day traveling back and forth to the dumps.

Load-Packers* provide bigger loads, more sanitary collection

"Since *hauling* thus accounted for a good portion of overall costs, we had to remedy this situation as soon as possible," says George G. Hyland, Boston's Commissioner of Public Works. "Investigation showed that enclosed, compaction-type refuse collection bodies were a basic solution. Their bigger loads would increase the productivity of truck and crew *collection* time and decrease *transportation* time to dumps. At the same time, our waste collection would be more sanitary, and refuse trucks no longer would be offensive to citizens."

To encourage private contractors, who collect Boston's refuse, to buy modern equipment, Boston *accepted bids for 2- or 3-year periods on work done with enclosed truck.* This gave owners a chance to amortize the cost of their purchases. Bids for work done with open trucks covered only 1-year, as usual.

Save thousands of dollars

Of Boston's 17 sanitary districts, 11 are now equipped with packer trucks. Most of these are 16-yard Gar Wood Load-Packers. The other 6 districts will have packers by the end of 1955. Most contractors standardized on Gar Wood units because of their big load capacities. Areas with new equipment need *only two-thirds as many trucks and men as formerly used* . . . a reduction that will save Boston thousands of dollars in contract costs.

Let us show you

Let us demonstrate how the Load-Packer's *bigger capacity savings* can make *your* service budget go further. Ask your local Gar Wood Distributor to help you analyze costs.

He'll be glad to show you a Load-Packer in action, so you can judge its advantages for yourself. *There's a size to fit your needs . . . 10, 13, 16, 20, and 24 yds.*

One of four Load-Packers owned by Dooley Brothers Inc. dumps load of refuse in chute leading to scow moored in slip below. About 30% of the city's refuse is sent to two receiving stations like this for disposal on Spectacle Island in Boston's harbor. The remaining 70% is carried to open mainland dumps in outlying areas. Incineration will eliminate these disposal methods.

*Load-Packers is the registered trademark of Gar Wood Industries, Inc.

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Committee to Revise Pavement Specs

Revised Specifications to Cover Portland Cement Concrete Pavements

Warren A. Coolidge, Director of Public Works of Nashville, Tennessee and President of the APWA, recently appointed a new Committee to revise the 1944 edition of the Association's Standard Specification —F—Portland Cement Concrete Pavements. The seven-man committee is headed by Edwin H. Pate, Consulting Engineer, who serves as City Engineer for Lincoln Park and several other Michigan municipalities. Other members of this Committee are: J. O. Armstrong, City Engineer, Kansas City, Kansas; Arthur Darlow, Director of Engineering, Miami, Florida; James Robertson, Assistant City Engineer of Seattle, Washington; James H. McKay, Highway Engineer, Baltimore, Maryland; Robert F. Werner, Chief Engineer, Columbus, Ohio and Leo M. Arms, Manager of the Highways and Municipal Bureau of the Portland Cement Association of Chicago, Illinois. The 1955 edition of this specification is expected to be ready for publication during the latter part of the year, and will be made available to members.

Exhibit Space Contracts Being Received for Milwaukee Show

Brochures containing complete information about the Milwaukee Equipment Show to be held October 2-5, in conjunction with the 1955 Public Works Congress were recently sent to prospective exhibitors. Anyone who is interested in exhibiting their products at this outstanding event, who has not received the brochure, should write to the American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois without delay, since the available exhibit space is definitely limited.

Nearly 1500 persons including many of the top-ranking public works officials of this country are expected to attend the Congress and view the displays and demonstrations presented by sixty or seventy of the leading manufacturers of public works equipment, materials and supplies.

Refuse Authority Manager Speaks At Michigan Meeting

A regular monthly meeting of the Michigan Chapter was held in Detroit, December 23, and featured an interesting talk, with slides, by George G. Schmid, Engineer-Manager of the Southeastern Oakland County Garbage and Rubbish Authority. Pictures showing the various stages of construction of the Authority's new 450 ton incinerator were presented and discussed by Mr. Schmid. Eleven communities in the Detroit Metropolitan area will be served by this new incinerator which is expected to be placed in full operation in the near future.

Grider Named President of Georgia Chapter

A meeting of the Georgia Chapter was held in Atlanta, December 30, which resulted in the election of a new slate of officers for 1955. Douglas T. Grider, Director of Public Works of Columbus, was elected President of the Chapter to succeed J. J. Dean, Consulting Engineer of Albany. J. W. Ball, Jr., Sanitary Engineer of Atlanta was named Vice-President while G. W. Young was elected to the post of Secretary-Treasurer. Plans for a Spring meeting to be held in April or May of 1955 in Albany were also made. The officers of the Georgia Chapter are pictured herewith.

New officers named by the Georgia Chapter are, left to right, J. W. Ball, Jr., Vice-Pres.; D. T. Gridler, Pres.; J. J. Dean, Past Pres.; and G. W. Young, Sec'y

Private Use of Space Under ALLEYS and SIDEWALKS

KENNETH K. KING
Public Works Director
Phoenix, Arizona

THE City of Phoenix recently received a request from one of its large merchants to utilize the space under one of the downtown alleys for receiving merchandise. The use of such space by abutting merchants and businesses has not been permitted in the past except for the location of transformer vaults. Information about the practices followed in other cities was collected to guide us in the development of a sound policy to recommend to the City Council. The information received from 26 municipalities has been summarized in the table herewith, which appeared in the *Public Works Engineers' Newsletter* of the American Public Works Association. It is interesting to note that under-alley use is permitted by nine cities reporting, but that such use is generally limited to pedestrian tunnels. Thirteen cities indicate that under-

City	Alley Use Permitted	Under-Alley Charge	Under Sidewalk Use Permitted	Under Sidewalk Charge	Permit Revocable
Tucson, Ariz.	No.		Yes	No	Yes
Fort Worth, Texas	Yes, tunnels for customer passage	1% of assessed value of abutting property	Yes	No. ¾¢ per cubic foot per year recommended but not in effect	
Austin, Tex.	No. No requests		Yes	No	
Houston, Tex.	Yes. Tunnel for customer passage	1¢ per cubic foot per year	Yes	1¢ per cubic foot per year	Yes
San Antonio, Texas	Yes. Tunnel for customer passage	No	Yes	No	
Wichita, Kans.	No		Yes	3¢ per cubic foot per year	
Omaha, Nebr.	Yes	5% of assessed value of adjacent land, per year, for merchandising. 2½% for storage	Yes	3% of assessed value of adjacent land for merchandising. 1½% for storage	
Indianapolis, Ind.	Yes. For tunnels.	Based on assessed value of adjacent land. Specific charge not stated			Yes
Toledo, Ohio	Yes	5¢ per cubic foot for construction permit. Also annual inspection fee	Yes	5¢ per cubic foot for construction permit. Also annual inspection fee	Yes
Dayton, Ohio	No. No requests		Yes	20¢ per lineal foot permit fee, minimum $27.00. No annual charge	Yes
Grand Rapids Mich.	No. Prohibited by charter		No		
Louisville, Ky.	Yes. Pedestrian tunnels	$500 for 20-year franchise	Yes	$500 for 20-year franchise	
Memphis, Tenn.	No		No		
Philadelphia, Penn.			Yes	$5.00 per front foot for permit. Apparently no later rental charge	
New Orleans, La.	No				
Minneapolis, Minn.	Yes, if no interference	Na	Yes	No	Yes
Baltimore, Md.	No		Yes	60¢, 90¢ or $1.25 per sq. foot per year	
Richmond, Va.	No		Yes	25¢ per sq. foot per year	Yes
Norfolk, Va.			Yes	No	Yes
Columbia, S. Car.	No. No requests		Yes	No	Yes
Rochester, N. Y.	Yes—could but have none		Yes	No	
Portland, Me.	No		Yes	No	
Hartford, Conn.	No alleys		Yes	No	Yes
Worcester, Mass.	No alleys		Yes	No	
Miami, Fla.	No		No		
Denver, Colo.	No. (Except by vote of people)		Yes	No	Yes

alley use is not permitted. Twenty-one cities state that under-sidewalk use is not permitted. Eleven cities informed us that all under-alley and/or under-sidewalk permits that are issued are revocable.

• • •

Bathing Beach Pollution Test Methods Challenged

SIGNIFICANT weaknesses in present methods of determining pollution of bathing beach areas were enumerated by Harold Romer at a panel discussion of the Sanitary Engineering Section of the American Society of Civil Engineers, held December 1 at Columbia University. Mr. Romer, chief of Waste Disposal and Pollution Control for the New York City Department of Health also urged that a committee be organized to develop uniform and reliable guides to pollution evaluation.

Deficiencies in present sampling and testing methods include:

1. Use of too few portions per dilution of the samples tested for bacteriological content. Greater accuracy is obtained by using multiple portions per dilution. However, some laboratories take only a single portion per dilution, giving a 1:8 ratio of reliability, which is far too large to allow a significant report of pollution conditions.

2. Improper evaluation of the polluting effects of the tides. In New York's Coney Island area, the incoming tide has yielded over eight times as many coliform organisms as the outgoing tide. Therefore, an average of incoming and outgoing coliform densities cannot reflect a valid public health picture and is a misleading measure of pollution conditions.

3. Effects of the range of the tide have not been properly evaluated. A tidal range of 6 feet may carry almost four times as much pollution as one of 3 feet.

4. The number and frequency of samples may be insufficient to arrive at a properly weighted average. It was recommended that experienced statisticians be consulted to determine these requirements. Many agencies use a single sample of water, taken on a particular day, as a basis of that day's report, rather than multiple samples taken over a period of several days which is the more accurate method.

5. Logarithmic averages, if used, will minimize the effect of high coliform densities. The use of arithmetic averages which have greater public health meaning was recommended; log averages may not be used without sound mathematical reasons.

Other members of the panel included Richard McLaughlin, director of sanitation for Westchester County; T. K. McCormick, director of sanitation for Nassau County; and Alfred Fletcher, of the New Jersey Department of Health. Mr. McCormick and Mr. Fletcher described the administrative work in bathing beach sanitation in their respective areas, emphasizing the importance not only of bacteriological sanitation but also of good personnel to operate the facilities and the need for adequate bathhouse structures.

Mr. McLaughlin echoed the opinion that the public health significance of the sanitary control of bathing beaches is not based on proven elements of sanitation. Nevertheless, there is some evidence that identifies beaches with disease. He directed attention to the record of more cases of ear, eye, nose and throat, skin infections and gastro-intestinal upsets reported among bathers than non-bathers.

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

Public Works Emphasized

President Eisenhower's Washington Local Government Conference, held in the nation's capital December 2-3, saw heavy emphasis placed on public works. Prominently featured on the agenda, arranged by the White House Staff, was U. S. Public Works Coordinator, General J. S. Bragdon. A member of the President's staff, General Bragdon told the mayors and city managers of 200 of the nation's largest cities, after they were welcomed by the President that public works planning is one of the important considerations of the Administration not only as an anti-recessional practice, but because it was one of the elements of sound public administration.

Excerpts from this important speech are as follows:

"The President has not only indicated his interest but his desire for a high level of local public works for the purposes of (a) adequately meeting community needs, (b) keeping pace with and contributing to their economic growth, and (c) as a potential element in stemming threatened declines in the economy.

"Construction in 1953 was $35.3 billion or about 9.7% of the Gross National Product. Public works expenditures accounted for 32.3% of construction or $11.4 billion, or 3.2% of the Gross National Product, with private construction being $23.9 billion or 67.7% of the total. For a Gross National Product of $500 billion, at the same rate, the public works component would be $16 billions. Federal public works in 1953 amounted to $4.8 billions, or 42.6% of the total public works. State and local public works was $6.5 billions, 54.7% of total. Public works in municipalities was $2 billion, or 30.1% of the State-local total . . .

"Some *backlogs* of public works in the State and local field have been estimated at $16 billions in the field of elementary and secondary education, exclusive of provisions for growth; $13 billions in the field of health facilities; $3 billions in urban water supply needs and about $2¾ billions in municipal sewerage works.

"It is therefore evident that any treatment of public works would be unbalanced without consideration of the larger component of the State-city-local segment.

"Policies for increasing the efficiency and coordination of Federal public works in the field of water resources, both in planning and execution, are being actively studied by the Cabinet Committee appointed by the President. These cover definition of the spheres of interest of Federal, State and local governments; provision for cooperation with States and local communities; and standardization of methods of determining justification of programs and projects. Another committee, the Committee on Intergovernmental Relations, is studying the respective roles of the echelons of government in important public works areas.

"There is now being made a new sample survey by the Bureau of the Census of the volume of planned public works under way and/or available in States, cities and other local governments. The survey is about ¾ completed and indications are that it will develop 6,000 to 8,000 line items. We ask your assistance in giving us the data requested. It is not by project but by groups (nine in number) of the normal *types* of projects cities must build. These are further classified into 3 major categories as to state of readiness. A very few questions as to the status of authorizations and funds availability were included. The aim was to make the inquiry as simple as possible so that even small planning organizations may quickly prepare the answers.

"We would like to emphasize (1) the necessity of an effective city planning *organization;* (2) the building up in municipalties, as a result of planning, a reserve of planned

public works which is a part of your long-term capital building program; (3) the building up of cash reserves and borrowing capacity in prosperous times so that when there are dips in the economy capital public works programs may be increased, with the resulting benefits of alleviating unemployment, increasing production and purchasing power, and at the same time securing your capital assets at cheaper prices than in boom times.

Water Pollution Meeting

An important meeting, attended by the Surgeon General of the Public Health Service, was held in Washington. About 20 representatives of professional, industrial and conservation groups met to discuss water pollution problems. Samuel S. Baxter, Water Commissioner of Philadelphia, represented the American Public Works Association at this meeting. The meeting was necessitated because significant increases in water pollution and its economic impact make it "urgent to develop more effective means of stimulating necessary remedial measures." The Department of Health, Education and Welfare's present program is based on authorization of the Water Pollution Control Act of 1948. The meeting considered the short-comings of the present water pollution control program and identified additional steps that might be taken to improve the situation.

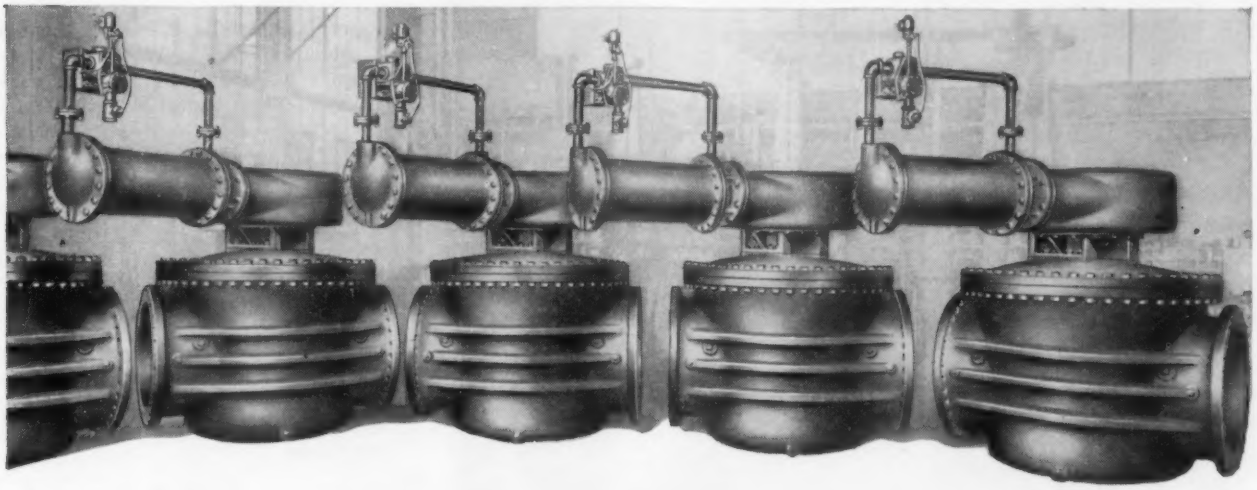
Urban Renewal

A new publication was recently issued by the Office of the Administrator, Housing and Home Finance Agency, Washington 25, D. C., which is titled "An Introduction to Urban Renewal, as authorized by the Housing Act of 1954". It consists of a brief review of the principal provisions of the Urban Renewal Program and the functions of the operating agencies with primary responsibilities under the act.

"Each locality", it points out, "must decide for itself what it wants to do toward preventing and eliminating blight and renewing its blighted areas. If it chooses only to undertake better code enforcement and local or private rehabilitation of houses, it probably can do this with resources already available and without any of the special urban renewal aids of the Federal government. But if it determines to undertake a comprehensive program involving, in addition to code enforcement and private rehabilitation, the upgrading of neighborhoods, the provision of new housing and community facilities, the clearance of un-economic slum areas, the relocation in acceptable housing of displaced families, it may need certain types of assistance to supplement its own and private resources."

One of the principal provisions of the Act is that no contract may be entered into for any loan or capital grant unless there is presented to the Administrator by the locality a "workable program"—which shall include, among other things, an official plan of action, as it exists from time to time, for dealing effectively with the problem of slums and blight within the community and for the establishment and preservation of a well-planned community with well organized residential neighborhoods of decent homes and suitable living environment for adequate family life.

Any community interested in the development of a "workable program" can secure from the Division of Slum Clearance and Urban Redevelopment or from the regional offices of the Office of the Administrator of the Housing and Home Finance Agency, a pamphlet entitled, "How Localities Can Develop a Workable Program for Urban Renewal" and also an "Outline of



36" CONE VALVES *with clear* OPENING

To supplement its hydro-electric power, TVA has built a series of steam plants on the Tennessee and Ohio rivers. These new units will furnish power required for Atomic Energy and other projects.

In this vital program, 52 Chapman Automatic Cone Valves were utilized for these plants . . . to act as check valves on the condenser water pumps. Each of these valves weighs approximately 11 tons.

Chapman designs and builds these valves in a range of sizes from 6" to 48" for check, throttling, pressure reduction and stop valve service. This is only one of many special Chapman valves. Remember, there's no problem in flow control that's too big or too tough for Chapman. That's why it saves time and money to *check with Chapman first, every time.*

The CHAPMAN VALVE
MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS

ON BADGER PIPELINE sections recently completed, Contracting and Material Co. of Evanston, Ill. reported their Cleveland "240" stayed well ahead of the pipe gang even where they encountered tough digging like that shown. Get further information on the "240" for your 1955 trenching requirements from *your Cleveland Distributor* or from *The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.*

Essentials to be Covered in an Application for a Workable Program". A Federal advance for surveys and plans for an urban renewal project, however, may be made before the "workable program" of the locality involved, has been approved.

The Division of Slum Clearance and Urban Redevelopment has been designated as the unit within the Housing and Home Finance Agency to furnish to communities, at their request, assistance in the preparation of a "workable program" and to provide them with technical and professional assistance for planning and developing local urban renewal programs.

• • •

Reducing Ditching and Shoulder Costs on County Blacktop

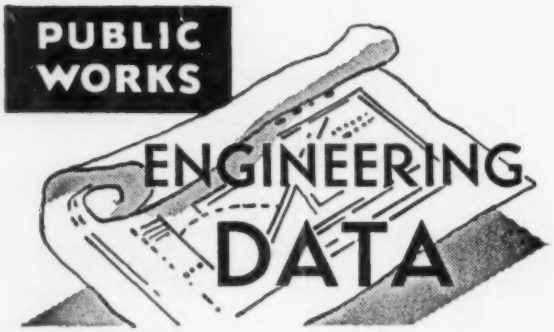
A cost-cutting method of ditching and building shoulders is being used by the State Contracting & Stone Co., Hartford, Kentucky on county-road blacktopping contracts. Working as a team, a Model D Tournapull and a #12 motor grader do the work that was formerly assigned to a motor grader, a loader and a fleet of four to five trucks.

Here's the way the operation works: The grader cuts the ditch, casting the material up on the shoulder and to the edge of the road. If there is more material than is necessary to build the shoulder, the Tournapull self-loads the excess and hauls it away to a low spot where more dirt is needed. The Tournapull can load off the new blacktop surface because it is equipped with a straight finishing blade and, the operator has precise control and can "float" the blade on the surface when loading.

Should additional material be necessary to build up the shoulder, the Tournapull self-loads from some spot along the right-of-way, and hauls in as much material as might be needed. When extra material is not available along the right-of-way, this contractor has an excellent method of obtaining the necessary dirt. He will arrange with a nearby farmer to dig a stockpond (at no cost to the farmer) in exchange for the dirt excavated.

When the Tournapull is hauling in extra dirt, it is spread along the shoulder and edge of the road in an even layer, of whatever depth required. The grader then blades excess material off the blacktop surface and onto the shoulder.

Using this combination, this contractor is able to average one mile of ditch and shoulder a day.



Report on Experiments in Garbage Cooking

Cooking of all garbage fed to hogs in Pennsylvania has been required since July 1, 1953. In order to provide information for local garbage feeders, experiments on the cooking of garbage were conducted at Philadelphia's Harrowgate incinerator. The work was done under the direction of John A. Bailey, Deputy Commissioner of the Department of Streets of Philadelphia, and E. T. Williamson, Superintendent of the Harrowgate incinerator. A full account of the work appeared in *Public Health Reports* for October, 1954. The following data are from that article.

When cooking at high pressure, from 50 to 70 psig, much of the garbage material was caramelized on the outside before it was thoroughly cooked on the inside. In the first 25 loads tested, a large amount of the garbage was obviously unpalatable since the pigs left the burned matter on the feeding floor. If the tank is brought quickly to a predetermined pressure by the use of high pressure steam and then cooked at a low pressure—5 to 15 psig—the material is not caramelized. A 30-minute cooking by this method appears satisfactory.

In open truck cooking, the load was covered with a tight tarpaulin, but much steam was wasted. It was estimated that 4 to 8 times as much steam was required for open cooking as for pressure cooking. Further, it was estimated that cooking in a large plant, such as at an incinerator, would cost about 60 cents a ton, including depreciation, with pressure cooking; and about 95 cents a ton in open trucks.

Though steam can be produced cheaply at an incinerator, it appears that there would be a delay of about 90 minutes if a farmer brought in his garbage for cooking, during which time the truck and the accompanying laborers would stand idle.

Miniature Traffic Light Models To Teach School Children

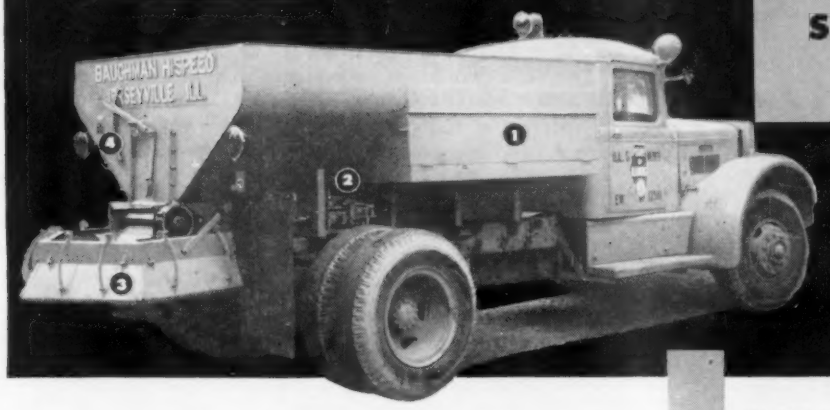
A special educational feature developed by the Department of Public Works of the City and County of Honolulu, and described in its annual report, is reported to have attracted much attention and favorable comment by all who have seen it. This feature, which was in operation during the 1953 school year, consists of a complete set of miniature working models of traffic signal lights made by Traffic Engineer Charles R. Welsh, assisted by Edward Nishimura, electrician with the Traffic Safety Division. The models were used in cooperation with the Traffic Division of the Honolulu Police Department. That Division assigned two of its officers, with Sgt. Harry

Power Take-Off Model

1. Tool Box
2. Two-Speed Transmission on Power Take-Off
3. Distributor Baffles
4. Endgate Quadrant
5. Baughman Gear Case

The Improved Baughman

Model K4SC SAND & CINDER SPREADER

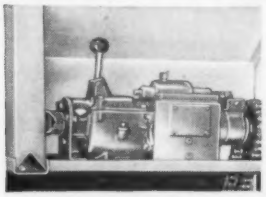


America's No. 1 Name IN ICE CONTROL EQUIPMENT

for the uniformly controlled application of CINDERS, SAND, SALT, CHLORIDE, CHAT or GRAVEL

- **Available in Two Models:** Power Take-Off (above) or Auxiliary Engine Drive (see below).
- **Adjustable Spread:** Can be accurately adjusted to spread to the right or left, in a constantly uniform pattern. Metering-type endgate has 60 individual adjustments.
- **Electro-Welded Body:** Rugged, one-piece welded construction—with streamlined design that insures better material flow.
- **Many Other Uses:** For spreading lime or fertilizer, for building up road shoulders, seal coating, or sowing seeds in parks and along highways. With Split-Bottom Accessory (see reverse side) the body can be used as a regular dump body.
- **A Size to Fit Every Requirement:** *Widths:* 6′ 6″ and 7′ 10″. *Lengths:* from 8′ to 17′. *Capacities:* from 4 cu. yds. to 17 cu. yds. Larger sizes built on special order.

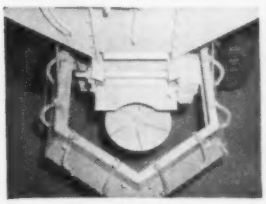
Increase Your SPREADING EFFICIENCY with these 3 *Baughman* Features:



Baughman 2-Speed Transmission. Regulates speed of conveyor chain. Permits the operator to spread a thick or thin application as the case may require.

Oil-Sealed Clutch. Permits spot-spreading, as at intersections, safety zones, and other special areas—without having to stop or start. One-man cab control insures the driver's safety during all spreading operations.

Note: Both the transmission and clutch are optional equipment, designed to improve the operating efficiency of the K4SC.



Patented Safety Baffles. Put the material where you want it. Easily adjusted to regulate coverage from 8 to 40 foot widths. Baffles deflect material onto the road or street—prevent injury to pedestrians or damage to passing cars.

AUXILIARY GAS ENGINE — When equipped with Auxiliary Gas Engine as shown in photo at right, the Baughman Body is a complete unit. The auxiliary engine provides the drive for both the conveyor and the distributor. Exhaust gases are circulated through the length of the body bed to prevent freezing of material. This body can be moved as a unit, can be set within a regular dump body and be ready to operate in as little as 12 minutes—since there are no power take-off connections necessary. Tool compartment on this model is mounted on the left side of body (optional equipment).

"When You Own a BAUGHMAN . . . You Know You Own the FINEST"

BAUGHMAN MANUFACTURING CO.

224 Arch Street • Jerseyville, Illinois

Now's the time to mail this month's Readers' Service card.

Phillips as instructor, to take this miniature traffic light setup to all the schools on Oahu to demonstrate traffic safety practices.

With the lights are 14 miniature automobiles and one fire truck. For the demonstration, a miniature intersection is set up with white lines on the pavement or playground and the lights put into operation, simulating a typical full-scale signalized intersection. The children then operate the miniature cars under the police instructors. The main idea is to train these youngsters in basic traffic safety and to have them pass the message on in their respective homes. "To all appearances, this seems to be the best method we have devised to date to enlist the interest of the small children in a traffic safety campaign. They appear to have absorbed the idea that they too have a responsibility in crossing streets at crosswalks and watching for oncoming traffic. At the end of 1953, 48 schools had participated in this educational program. It has been ascertained that many of the children who have been given this instruction have developed into quite articulate 'back seat' drivers.

"It is only fair to state that this educational setup was made possible by Aloha Motors and Sears Roebuck, who supplied the miniature cars, and the Von Hamm-Young Co., who furnished the truck for transporting the equipment.

"This particular activity of the Division of Traffic Safety is included in the report to emphasize the point that all members of the Division are constantly on the alert for new ideas on methods to promote greater safety on our public highways. Also, it is desired to invite attention to the close cooperation between the Traffic Division of the Honolulu Police Department and the Division of Traffic Safety."

Municipal Parking Lots Show Surplus

There are three municipally owned and operated parking lots in downtown Sacramento, Calif. These have a total capacity of 864 cars. Parking rates at two of the lots are 10 cents an hour for each of the first two hours and 15 cents an hour thereafter. The third lot, which is designed for all-day parkers, has a rate of 40 cents per day or $7 per month. The evening rate is 35 cents. Operation of the lots is by a foreman and 11 assistants. During the past fiscal year, operations showed a surplus of $54,629.

Use of Excavated Material From Streets

When streets are graded in Green Bay, Wisc., the excavated material is used for the following purposes in the following order: (1) For filling in that street when required; (2) for filling on abutting property; (3) for filling city property, if needed. Any surplus above these three priorities is sold by the city engineer at established rates.

Beach Cleaning at San Diego

The beach cleaning program initiated in 1953 was set up on a scheduled 3-cleanings-per-week basis and considerably improved and expanded, additional personnel and equipment being assigned to the program during the summer months. Experiments to improve the performance of present equipment are being continued and trails of new cleaning equipment are currently underway. A total of 19,050 linear feet of beach area under County control was kept reasonably free of kelp and debris last summer. (This data appeared in the Annual Report of the Public Works Department of the County of San Diego.)

"Our Norton plates lasted sixteen years"

Massachusetts plant finds Norton Rx (engineered and prescribed) porous mediums a profitable investment

Ready For Many More Years Of Trouble-Free Service. Norton ALUNDUM* plates are replaced with new ones after 16 years of service in the Leominster, Mass., sewage disposal plant. Norton engineered and prescribed porous mediums supply money-saving Rx's for many important applications.

Selecting replacements for plates was no problem at this sewage plant. Like so many other users of Norton plates, they had ample proof — 16 years of it, in fact — of the outstanding efficiency and service life engineered into all Norton porous mediums.

Patented *controlled structure* processing of Norton ALUNDUM porous mediums assures even distribution of pores in sizes and open-pore ratios that make them the ideal Rx's for uniform diffusion. And Norton tubes bring you this uniform diffusion over their entire area, thanks to their seamless construction that also makes them much easier to clean.

Many Other Advantages

of Norton Rx porous mediums include exceptional resistance to breakage, chipping and to cleaning acids. You can get them in a wide range of sizes . . . tubes and discs for aeration in activated sludge treatment . . . tubes for diatomite filters in swimming pools . . . plates for rapid sand filters in water filtration.

Norton Can Supply You

with illustrated booklets, charts, tables and other helpful information on all porous medium applications. Ask your Norton Representative, or write to NORTON COMPANY, 901 New Bond St., Worcester 6, Massachusetts.

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POROUS MEDIUMS

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Making better products... to make other products better

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Two-Way Radio Speeds Public Works Operations

The Public Works Department of Montgomery County, Md., has found many time and money saving uses for a recently installed two-way radio. After last fall's storms, highways were cleared in record time; work stoppages because of needed equipment and/or material have been much reduced. The cost, $46,000, included 36 mobile units, three base stations and two automatic repeaters. The latter permit 24-hour operation without a dispatcher, and contacts can be made directly between units of the public works fleet.

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REPAIRING SIDEWALKS with Asphaltic Mix

LIKE many municipalities, East Cleveland, O., had been inspecting sidewalks and serving the property owner with notices to repair failures. The owners in some instances attempted to make the repairs themselves, usually with poor results. In other cases the City replaced the damaged walk. The latter policy proved to be so time consuming and costly that a more economical and expeditious method had to be developed.

The use of asphalt for sidewalk repairs evolved from experimenting with minor repairs. Slabs which were out of grade were adjusted by painting with emulsion and brought up to grade with an asphalt mixture. These repairs were reinspected the following spring and found to have withstood the weathering action of the winter season. This pilot work indicated that the asphalt mix had an excellent bond with the old surfaces of stone and concrete as well as providing a long lasting safe surface. The results of this experimentation justified the establishment of a city-wide sidewalk repair program utilizing the asphaltic mixture.

In repair work, the joints, small holes, and surface of the sidewalk are cleaned of all mud, dust or foreign matter and allowed to dry. The area to be repaired is painted with a prime coat of asphalt emulsion.

Slabs which have settled more on one side than on the other are corrected with a wedge-shaped patch. The length of the wedge is made twelve times the displacement of the slab at the crack. A slab which has settled 1¼ inches as measured at the crack is patched with a 15-inch wedge of asphalt. Special attention is given to assure that surfaces to be patched are completely painted with asphalt emulsion before placing patching material.

Aggregates and asphalt are mixed at a temperature of 225 degrees in a McConnaughay pugmill of 3½-cubic foot capacity. While the asphalt mix is a composition similar to that known as T-34 of the Ohio Highway Department, the highway specifications were modified and a No. 9 aggregate substituted for the No. 6 aggregate used in T-34. The bituminous material is asphalt emulsion MS-2.

The surfacing material is placed on the walk and tamped by hand with metal tampers. Portland cement is dusted over the patch surface, sprinkled with water and broomed to produce a light surface.

The success of the East Cleveland project which was reported in *Ohio Municipalities* by Malcolm S. Douglas, City Engineer, is credited to the combined efforts of William L. Robertson, Assistant Engineer, and Joseph V. Henry, Service Superintendent.

PUBLIC WORKS DIGESTS

The SEWERAGE AND REFUSE Digest

An English Stormwater Overflow

To bring its sewage to a new sewage treatment plant at a new location, Taunton, England, collected the sewage into a 72-in. outlet. The storm weather flow greatly exceeds the dry weather, and a storm overflow diverts to the river all in excess of 6 times the dry weather flow. The operation of the storm overflow chamber is based upon chokepipe control, the choke pipe being 24 in. in diameter and 390 ft. long. The excess will flow over a side weir 60 ft. long and be conducted to the river through a 66-in. pipe line 500 ft. long. From the end of the choke pipe, the main sewer, reduced to 42 in. in diameter, continues about 13,000 ft. to the treatment plant.

"Taunton's New Scheme of Sewage Disposal". *The Surveyor,* Oct. 30.

Compaction Refuse Collection Trucks Economical

Boston, Mass. found that, when refuse was collected in open trucks and hauled to local dumps, the cost of transportation was 22.4 percent of the total cost; and when local dumps were closed and longer hauls became necessary, transportation cost 54 percent of the total. To reduce the transportation costs, enclosed, compaction type refuse collection bodies were found to be a basic solution, and also are more sanitary. At present, 11 of the 17 districts are equipped with such trucks. Approximately 70 percent of the city's refuse goes to open mainland dumps; the rest is taken by scows to dumps on an island in Boston harbor at a cost of $3.50 a ton. It is believed that incineration will prove to be the most satisfactory long-range solution of the refuse problem.

"Modern Packer Trucks and Incineration". By George G. Hyland, Com'r. of Pub. Wks. *American City,* December.

Repairing a Segment Tile Sewer

Edmonton has recently repaired a 54-in. segment tile sewer built in 1929, the arch of which had cracked and begun to settle at two stretches 50 ft. and 75 ft. long, respectively. The work was made more difficult by the fact that the sewer was more than 50 ft. below the street surface in one of the busiest downtown streets; and the nearest access to the sewer was 250 ft. from the nearer of the repair jobs. Steel rings to support a lining were used, 50-in. in diameter, leaving a 2-in. space outside of them for inserting poling boards. Each ring was made in two halves to be bolted together, since a whole ring could not be passed down the manhole. Thus practically a wooden pipe was constructed inside the sewer. Borings in the roof showed it to be covered with 4 to 8 ft. depth of sand with hard blue clay above it, which had caved in due to the rotting of the old construction shoring, which had been left in. A 3-in. layer of gunite concrete was applied over steel mesh covering the arch portion of the sewer. Every 10 ft. along the job, two 1½-in. steel pipes had been pushed up through the tile into the sand, and after the concrete lining had set, grout was forced up into the sand under 50 to 60 lb. pressure, through hose from a grout truck on the surface. One of the repair jobs was more than 500 ft. from the manhole, and to get the grout to this, a hole was bored vertically from the ground surface and cased with old oil well casing and the grouting hose passed down through this.

"Oil Well Tricks Blend With Sewer Maintenance." By A. J. Mair. *Public Works,* January.

Correcting Some Digester Troubles

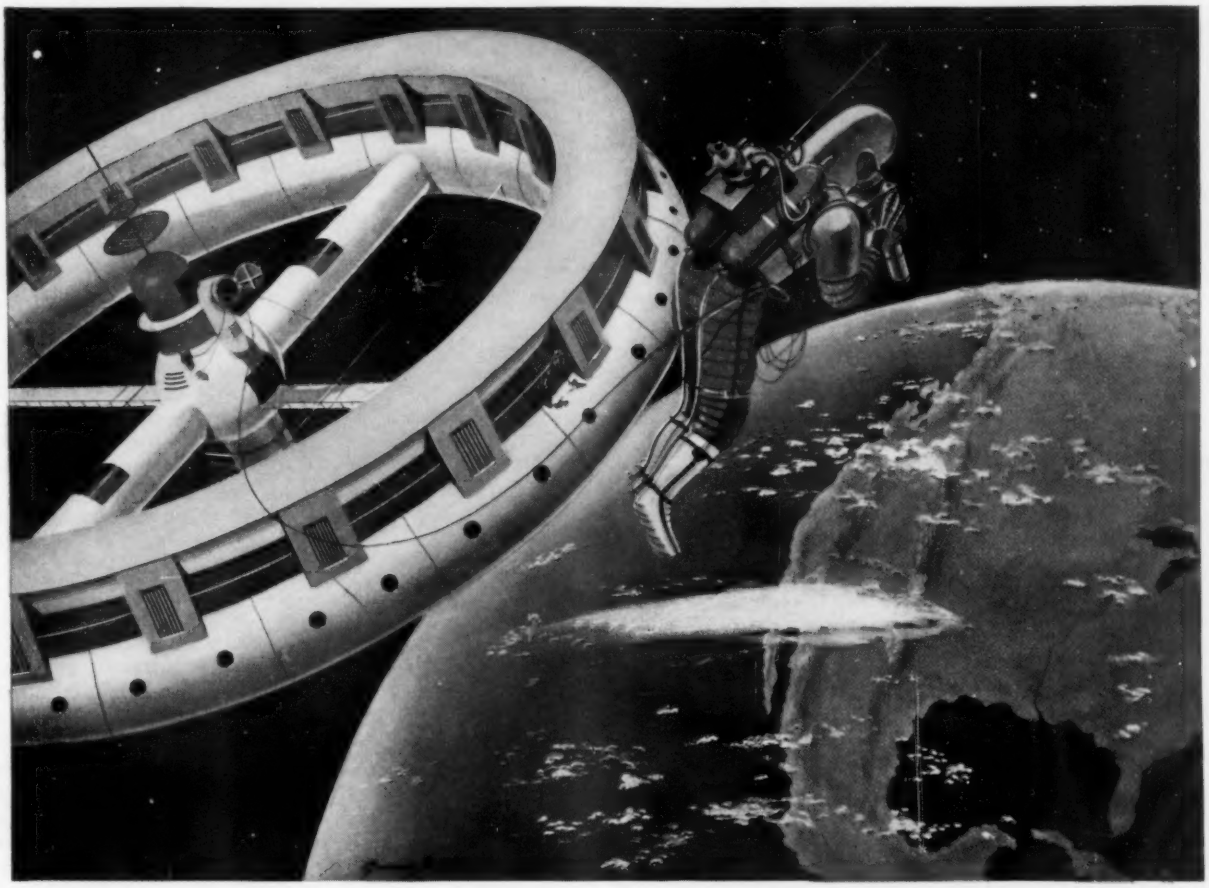
The author, an engineer of the Pennsylvania State Dept. of Health, discusses the operation of digesters as illustrated by a number of plants in that state. Important are control of temperature, pH and alkalinity; also the keeping of records to enable the operator to detect deviations from normal conditions. He tells how operators have corrected troubles due to acid conditions, scum, foaming and grit. Discusses cleaning and restoring of digesters, and disposal of sludge removed in cleaning. Also the effects of home garbage grinders are considered.

"Digester Problems". By John Yenchko, Asst. Regional San. Engr. Penn. State Dept. of Health. *Water & Sewage Works,* December.

Liners for Garbage Cans

In 1954, Hartford, Conn. began trying the use of paper liners for garbage cans, a novelty in the collection of garbage. The previous year, the Union Bag and Paper Co. had developed a wet-strength bag to be used as a liner for garbage cans, trying different types of chemicals and adhesives and various weights of paper and methods of construction. The purpose was to provide a bag that, when full of garbage, could be lifted out of the can and thrown into the collection truck, a new liner being left in the can to replace it. Tests of 6,000 bags in Hartford showed that there are many economies to offset the cost of the bags. The collector does not have to make return trips to replace empty cans; he can carry twice as many bags as cans at a time; there is no time required to clean up spillage, which is practically eliminated. The collection is practically noiseless and the cans are not damaged. The bags are made slightly smaller than the cans so they can be lifted out easily. They are made of resin-treated Kraft paper and hold 40 lb. of wet garbage, or 80 lb. of dry refuse.

"New System of Refuse Collection Uses Wet-Strength Bags." *Public Works,* January.



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100 years from now... A MAN-MADE "MOON" MAY BE OUR WEATHER BUREAU

OUR WORLD of tomorrow will bring many changes. But in one vital aspect of American living, your great-grandchildren will continue to enjoy the same dependability and service you know today. *Cast iron pipe laid today will still carry water and gas to their homes.*

Today, over sixty American cities and towns are still served by cast iron water and gas mains laid 100 and more years ago. And modernized cast iron pipe, centrifugally cast, is even stronger, tougher, more durable.

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The Biota of Treatment Plants

Of the biota (assemblage of living things, both plant and animal) found in sewage treatment plants, the plants are mostly restricted to bacteria, actinomycetes and the higher fungi. Some of them occur so abundantly in certain types of wastes that their presence can almost be called indicative of that waste or of conditions it causes; dominance of a species in a waste can tell us something about the possible treatment of that waste. But at present we have far too little knowledge of either the work done by individual species or how we can utilize particular species or groups of species for purification of particular wastes. Of the many animal species found in treatment plants, few seem to exhibit any indication of a particular type of waste, but certain ones almost surely indicate anaerobic conditions.

"We usually build a disposal unit and allow it and the nature of the waste to be the selective factors for the organisms doing the work. Perhaps it will eventually be proven best to resort to seeding with certain strains of micro-organisms and carefully controlling other environmental factors. . . The time is ripe and the demand pressing for fundamental research."

"How the Biota of Sewage and Industrial Wastes Work for Us." By James B. Lackey, Prof. of San. Eng. Univ. of Florida. *Wastes Engineering*, December.

Disposal of Sewage Sludge

A 64-page report on this problem has been prepared by a committee appointed by the British "Ministry of Housing and Local Government" which discusses all the conventional methods, and also new processes such as sludge flotation (the Dorrco Vacuator), consolidation and elutriation. Much attention is paid to dewatering, freezing, electro-osmosis, multiple-hearth drying with incineration, vacuum spray drying, vacuum filtration, and heat treatment. Disposal of sludge in the liquid state has advantages, but could be employed only seasonally, necessitating storage. Semi-dried sludge has an appeal to the agricultural field, and artificially dried sludge even more so but is costly. The production, use and sale of by-products is well covered. It is recommended that sludge digestion be incorporated, subject to certain exceptions, in all sizes of sewage treatment plant, for all types of sludge.

"Treatment and Disposal of Sewage Sludge." *The Surveyor*, Nov. 6.

Power from St. Louis's Incinerator

St. Louis is building an incinerator plant consisting of four 100-ton units, with forced draft underfed stokers. A pneumatic system is being installed for the removal of fly ash. The city is considering another incinerator of similar capacity, but using waste heat recovery in the generation of electric power. The local power company has agreed to purchase the power produced at ½ cent per kwh, which should gross $500,000 a year. They figure that labor and maintenance costs would not exceed $50,000, leaving a net profit of $450,000. The added cost of the generating equipment is estimated to be $3,500,000, so the plant could be amortized in about 8 years. The method of calculating these costs is described by the author.

"Generating Electric Power from

Digester and control building of the new Hobart plant completed in August, 1953

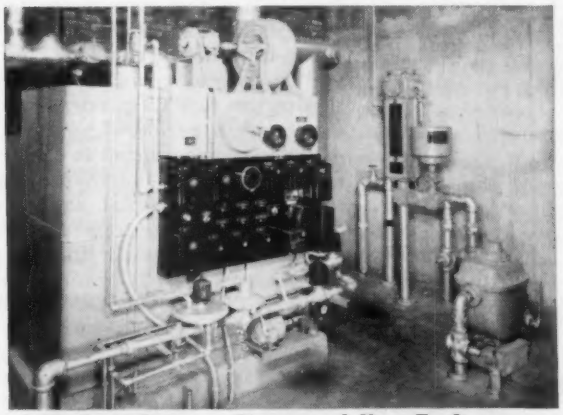
Hobart, Indiana Builds for Modern Sewage Treatment

WITH PFT "CONTROLLED DIGESTION"

Designed for a population equivalent of 12,000, Hobart's impressive new activated sludge plant provides modern, effective treatment. A complete line of PFT equipment is installed for up-to-date "controlled digestion!"

A *PFT Floating Cover* is installed in the 50′ digester (49,880 cu. ft. capacity) for simplicity of operation, positive scum submergence and safe utilization of gas. A *PFT Cover Position Indicator* with high and low level alarms shows the digester liquid level at a glance.

A *PFT Supernatant Selector* with *Gauge, Sight Glass and Sampler* unit provides for automatic withdrawal of the best digester liquor.



PFT #250 Digester Heater and Heat Exchanger

An effective part of Hobart's "controlled digestion" is the *PFT Heater & Heat Exchanger* (250,000 B.t.u. per hour). Fired by gas *or* oil, it cuts fuel costs by utilizing all sludge gas produced, switching to oil only when necessary to maintain optimum temperatures of 90° to 95°.

PFT Gas Safety Equipment in the plant includes: 3″ Waste Gas Burner; Flame Trap; Pressure Relief with Flame Trap; Flame Cell; Drip Taps; Gas Pressure Gauge.

At Hobart, as in all its installations, PFT assisted consulting engineers by showing the adaptability of its equipment in meeting specific plant requirements. PFT checks the installation of its equipment and stands squarely behind its successful operation.

Design of plant by / *Consoer, Townsend & Associates, Chicago*

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Waste Incinerator Gases." By Frank J. McDevitt, Pres., Bd. of Public Service. *Public Works*, January.

Other Articles

"Getting the Best **Performance** From Your Sewage Works". By Le Roy W. Van Kleeck, Prin. San. Engr., Conn. Dept. of Health. Wastes Engineering, December.

"Development in Water Pollution Research and in **Activated Sludge**" History. Abstracts of Report of British Water Pollution Research Board. By John Finch, Mgr., Sewage Disp. Dept., Rothenham, England. Water & Sewage Works, December.

"Operating a **New Sewage Plant**" at Jerome, Idaho. By James K. Ferrell, Supt. Water & Sewage Works, December.

"Designing **Small Sewage Works** for Rural Areas". An English viewpoint. By M. A. Kershaw. Municipal Engineering (England), Nov. 26.

"The **Effects of Detergents** Containing Wastes on Biological Forms and Water Uses." By Earnest F. Gloyna, Assoc. Prof., Univ. of Texas. Public Works, January.

"**Robot Pumping** Plant Handles Storm Drainage". Public Works, January.

"Is **Sanitary Land Fill** Right for Your Community?" By Joseph E. Skornicka, Caterpillar Tractor Co. Public Works, January.

"**Experimental Work** for Reading's New Sewage Disposal Scheme". Results of experiments in this English city since 1949. The Surveyor, Dec. 4.

Treatment in 22 California coastal cities on "U. S. 101 Highway to Health". By Harry N. Jenks. American City, December.

"**Single-Stage Biofilter** Serves Two Communities" in California. By David R. Miller. Public Works, January.

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Effect of Garbage Grinding on Sewage Treatment

THE requirement that garbage be cooked before feeding to hogs has apparently resulted in the installation of garbage grinding units in many hotels and restaurants in Minneapolis and St. Paul. Following a study, Kerwin L. Mick, Chief Engineer of the Minneapolis-St. Paul Sanitary District, reported on the effects and costs as follows:

1. The effect on the total volume of sewage flow will be minor, increasing less than 2 percent even if all garbage from homes and commercial establishments in the Twin Cities and suburbs was ground and discharged to the sewers connected to this treatment plant.

2. The strength of the sewage will be increased by the amount of dissolved and suspended solids added to it from the ground garbage. This increase will be appreciable, up to 40 percent if all garbage from homes and commercial establishments in the Twin Cities area connected to this plant were ground and discharged to the sewers. This increase will be gradual, however, in proportion to the rate of grinder installations over a period of years.

3. The increased cost to the Sanitary District will be in proportion to the increased total solids from the ground garbage treated and disposed of at this plant. In 1952 the total cost of operation and maintenance of the Sanitary District plant was $16.20 per ton of dry solids removed from the sewage. For purposes of this estimate a figure of $20 per ton will be used, to allow for the present trend of increasing costs since World War II and for an anticipated slightly higher cost per ton to handle the garbage solids as

compared with the normal sewage solids. As garbage normally averages about 20 percent solids, the Sanitary District cost estimate per ton of "green" or "wet" garbage would be $20 x 0.20 or $4. To this should be added the City of Minneapolis estimated expense for added sewer operation and maintenance costs, the cost of collection of any grinder fees, etc.

The estimated cost per home grinder may also be of interest. Assuming 0.5 lb. of garbage per person per day and 3.5 persons in the average household, a total of (0.5 x 3.5 x 365)/2,000 or 0.32 ton of "green" garbage per home grinder would be produced per year. At $4 per ton, the estimated cost to the Sanitary District for disposing of this ground garbage would be $1.28 per home grinder per year.

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Incinerator to Serve Twelve Communities

STEPS HAVE been taken by Hamilton County, O., toward an overall program for the disposal of refuse in the areas outside of the City of Cincinnati. The first portion of the program contemplates service in the eastern portion of the county, including the municipalities of Silverton, Deer Park, Montgomery, Indian Hill, Madiera, Mariemont, Terrace Park and Newtown. In addition, four Townships will be included—Symmes, Sycamore, Columbia and Anderson.

An estimated population of 47,200 will be served by this improvement. There are at present approximately 13,000 customers in the area being served by garbage collectors. Several of the municipalities collect the garbage with their own forces; the others by contract. All of these wastes are presently disposed of by hauling to dump and sanitary fill sites. The sites now used are all in the eastern portion of Hamilton County and in Clermont County. Collection methods and practice do not follow good sanitary procedure and many complaints have been received regarding the nuisance and health hazards resulting. Clermont County officials have objected strenuously to dumping of garbage in areas under their jurisdiction.

All garbage collection contractors and municipal officials in the area were surveyed to determine the number of customers served and the volume and weight of wastes handled. It was found that the total production of waste reported was 557 tons per week, of which 390 tons were deemed combustible. With a population of 47,200 and 2 lbs. per capita per day of total combustible waste, weekly production would be 330 tons. Design was based on the average of the two figures or 360 tons per week. The incinerator operational plan was based on 12½ hours per day burning.

The cost of the facilities is estimated at $400,000, as follows: Incinerator $102,500; chimney $22,985; incinerator building $152,645; bulldozer, loader and truck $20,000; land purchase, financing, engineering and other costs $101,870.

The project will be financed by the issuance of revenue bonds in the amount of $400,000. Such bonds will be retired from revenues charged the users of the incinerator. Inasmuch as the service will be available for the benefit of and will be used by the Villages and Townships, contracts between such political units and the Commissioners are contemplated which will insure and guarantee payment to the County for services rendered. The

various political units will in turn establish and collect such charges as will be necessary. Several methods of raising the necessary funds are open to the municipalities at their option. Funds for the purpose may be raised by tax levies or by establishing and collecting a garbage service charge, and these must cover collection, as well as incineration costs. The municipalities may contract with a private contractor to handle the work of collection and hauling to the incinerator site, and, in addition, to collect the service charge from each individual customer. The contractor must then turn the funds collected for incineration over to the municipality for payment of bills rendered by the County.

Operating costs are estimated at a total of $27,014 per annum to incinerate 20,280 tons of garbage, operating the incinerator 12½ hours per day (2 shifts of 8 hours), five days per week. One foreman, or superintendent, four laborers and one equipment operator will be required. In addition, there will be part time clerical service, fuel, light, power, maintenance, etc. Average annual debt service is estimated at $20,683.33, assuming revenue bonds running for 30 years and bearing an interest rate of 3 percent. In addition, there should be a "coverage" or leeway which is assumed at half the annual debt service or $10,341.67. The total operating cost is thus assumed at $58,039.60.

Assuming incineration of 360 tons of garbage per week, or 18,720 tons per year, the minimum service charge necessary is computed at $3.10 per ton. To allow for some margin of safety a charge of $3.25 per ton is recommended. Such a charge is estimated to produce an annual revenue of $60,840 which will provide $2,800 per annum for depreciation, over and above the other charges.

The plans and program for this installation were prepared by Alfred LeFeber & Associates, consulting engineers of Cincinnati. H. H. Mace, a member of the firm, is in charge of the project.

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Unaccounted For Water 5.62 Percent

During the 1953-54 fiscal year, the unaccounted for water in the Long Beach, Calif., Water Department amounted to 5.62 percent of the total in storage, pumped and purchased.

PUBLIC WORKS DIGESTS

The HIGHWAY AND AIRPORT *Digest*

New Asphalt Specifications in California

California highway engineers are trying out a new set of specifications for asphalts in the hope that they can increase the durability of asphaltic concrete pavement. A routine stretch of highway is being paved using asphalts from 8 sources, six of them meeting the new specifications and two of them meeting the old ones. The most important features of the new specifications are a higher minimum flush point and a new penetration ratio. Another new test is on viscosity. Solubility in carbon bisulfide has been abandoned and the carbon tetrachloride requirement is retained simply to control the possibility of contamination or adulteration.

"Road Job Tests New Asphalt Specs". *Engineering News-Record.* Dec. 23.

Highway Fill Is Also A Reservoir Embankment

The construction of Palisades dam in Idaho will cause the flooding of U. S. 26. This is being relocated along the north side of the reservoir a few feet above the level of the water. At one point it crosses a branch of the reservoir by a fill 1180 ft. long, where the water at one point is 140 ft. deep. Here an 84-in. culvert at the bottom of the valley connects the two parts of the reservoir; and seven 48-in. emergency culverts are laid 10 ft. below the top of the road. This fill contains 1,655,246 cu. yd. of material—supposed to be the largest highway fill in the United States. Because it serves also as a reservoir dam, this embankment is built like one, with an inner core of selected material placed in 8-in. layers, disced and rolled with heavy sheepsfoot rollers to 95 percent maximum density. The outer layer is of pit-run gravel placed in 12-in. layers, wet down, and compacted with 40,000 lb. crawler-type tractors; and this was covered with 3 ft. of riprap. Barco rammers were used to compact the fill around the culverts.

"Huge Fill Built Like a Dam". By Fred D. Miles, engineer, Idaho Dept. of Highways. *Roads and Streets,* December.

Emulsified Asphalt Slurry for Rough Pavements

Rough, cracked asphaltic pavements are being sealed in Los Angeles County, Calif., by an application of a slurry consisting of a mixture of fine aggregate, water and a slow-setting, mixing-grade emulsified asphalt. The aggregate is 3/16-in. or smaller. The asphalt content averages about 20 percent based on aggregate weight. Equal quantities of water and asphalt emulsion generally are used. The slurry is spread by a spreader box and squeezed into cracks, and levels off rough spots. It dries quickly and traffic is allowed over it within one hour.

"Slurry Seal Smooths Out Cracked Asphalt". *Engineering News-Record,* Dec. 23.

Tree Planting On Ontario Highways

As part of a continuing program, Ontario last year planted 326,465 trees and shrubs on highway borders, with a view not only to appearance but also as a substitute for snow fences. Existing trees are saved where possible. In a few years, Routes 400 and 401 near Toronto will be lined with banks of roses 6 to 8 ft. high and hedges of red barberry, lilac, spirea and other shrubs, which will serve to keep children and pedestrians off the fast expressway. Most of the trees used are grown in the government's own forestry nurseries.

"Trees for Highway Landscaping and Windbreaks." By James Montagnes. PUBLIC WORKS, January.

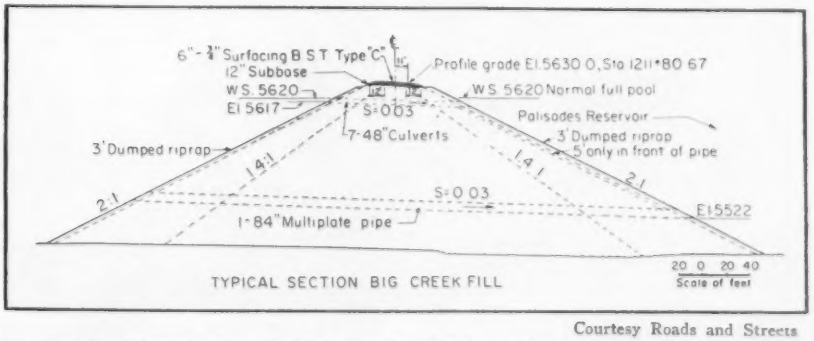
Testing Load Carrying Capacity

A new method of testing the load-carrying capacity of bituminous roads was tested recently at the Langley station of the Bureau of Public Roads. It uses a machine which simulates the jarring effects of traffic, and measures and records them on electronic devices. The factors measured include stiffness, strain, velocities of wave propagation, and fatigue.

"Better Highways Promised by New Road Testing Method". PUBLIC WORKS, January.

Scheduling A Construction Program

One of the problems of a highway administrator is scheduling a construction program which will not be upset by scarcity of materials, variable revenues or uncertain



Courtesy Roads and Streets

● **CROSS-SECTION through highway fill which is also a reservoir embankment.**

weather conditions. Unexpected weather conditions may so facilitate or delay work progress as to necessitate changes in the program of lettings. A schedule can be set up under one of two methods or a combination of both. One involves maintaining an average monthly total of work under way one-third in excess of the anticipated yearly expenditure; the other is by a project-by-project analysis basis. Each will give an indication of future funds that are necessary to maintain a balanced cash status, and is sensitive to the seasons. Adjustments must be made well in advance of anticipated changes in revenues or in construction progress. Long-range weather forecasts are helpful. An up-to-date accounting system is invaluable.

"Scheduling a Road Construction Program". By D. B. La Prade, Virginia Dept. of Highways. *Better Roads*, December.

Continuously Reinforced Concrete Pavements

Several such pavements have been built experimentally since 1938, with thicknesses ranging from 7 to 10 in., and with area of longitudinal steel ranging from 0.3 percent to 1.82 percent. All have been satisfactory. A percentage of 0.4 steel is believed to be adequate; more steel than is required is detrimental. The author discusses the theory and gives recommendations for designing. The advantages of such pavements he summarizes as follows:

1. Elimination of joints and open cracks. 2. Riding qualities approximately the same throughout the pavement life. 3. Longer life and less maintenance cost than non-reinforced concrete pavement. 4. Apparently a longer useful life than standard reinforced concrete pavement. 5. First cost comparable with that of standard reinforced concrete pavement.

"A Design for Continuously Reinforced Concrete Pavement". By Wayne R. Woolley, Republic Steel Corp. *Roads and Streets*, December.

Vandalism of Road Signs

Estimates of the cost of replacing or repairing signs and markers damaged by vandals range from about $800 for a county, to approximately $185,000 for a state. County and state officials contributing to a discussion of the subject have little hope that such vandalism can be eliminated or even decreased measurably. Results from intensive edu-

cational programs have been negligible in some states. Erecting signs 5 ft. or more from the ground has reduced vandalism by children to some extent. Vandalism is most prevalent during the hunting seasons and around halloween. Most states have laws making damaging a sign a misdemeanor, but few cases have ever reached court. The article quotes at length the statements of several officials.

"How to Curb Vandalism of Road Signs." *Better Roads*, December.

Other Articles

"Cold Asphalt Not a 'Summer Only' Surfacing Material". By William F. Rees. The Surveyor (England) Nov. 6.

"New **Traffic Light** Installations in London". Delays reduced by variable-time vehicle-actuated signals. The Surveyor (England), Dec. 4.

Traffic stripe paints, and methods of applying them in the Netherlands. "Wegenverf". By J. C. M. Sauerbier. Wegen (Holland), November.

"Methods and Costs on 29-Mile **Hot-Mix** Face Lifting Job". By E. O. Beatie, The Texas Co. Roads and Streets, December.

"Radar Speed Check" used at Grand Rapids in studying speed and traffic problems. By Jerome D. Franklin, Traffic Engr. Public Works, January.

"Soil Cement Paving Program" at Peoria, Ill. Public Works, January.

"Traffic Trouble on the Gold Coast" of Florida. By Guy Browning Arthur. Public Works, January.

"Skid Resistance on Rough and Smooth Road Surfaces". Research in England. The Surveyor, November 13.

"Connecticut **Contracts Maintenance Work**". The 8th of a series of articles. By G. Albert Hill, Commr., Conn. State H'way Dept. The Constructor, December.

"Materials and Equipment for **Bituminous Resurfacing**". A comprehensive discussion, covering preparation for resurfacing, resurfacing of concrete and of bituminous surfaces with road mix and with high-type bituminous mixtures. By Leo J. Ritter, Jr. Public Works, January.

"Asphalt Distributor **Dividends**" in Hopewell, Va. By R. Thomas Hobbs, City Manager. American City, December.

"How **Roads Become Streets** in Columbus." Roadway-type pavements converted to standard street design. By Robert F. Werner, City Engr. American City, December.

"Squeezing Cars Out of **Shopping Centers** in Chicago." By Richard L. Nelson, Exec. Vice Pres., Real Estate Research Corp. American City, December.

"Weight Limits on Secondary Roads". By Fred Burggraf, Dir., H'way Research Board. Better Roads, December.

Controlling Cracking in Bituminous Surfaces Over Concrete

THE Revere Resurfacing Project was built in the fall of 1952 by the Massachusetts Institute of Technology and the Massachusetts Department of Public Works to test experimental techniques of controlling reflection cracking in bituminous resurfacings. After 14 months of service, including one complete annual climatic cycle, several developments have taken place which lead to tentative conclusions. These are summarized in a recent Highway Research Abstract as follows:

Of the special joint treatments applied, the use of wire mesh to reinforce the resurfacing over the joint offers the most promise for controlling reflection cracking. However, the width of the mesh should be made greater than 4 feet to prevent a transfer of the crack from the joint to the edge of the mesh. Cement grout filler was effective in reducing movement at some joints, but not at others. Soil-mix placed in certain joints was ineffective in reducing movement and cracking. Neither building paper on the concrete nor the leveling of joints with bituminous mix had any significant influence on cracking. Both 11-gage plates and chain-link fence became springy and caused failures of the resurfacing by repeated flexing; 26-gage plates were more satisfactory.

More cracking has developed in the northbound roadway where the resurfacing is 2½ inches thick than in the southbound roadway where it is 3 inches thick. The section paved with rubber-asphalt mix has cracked less than either of the other two sections. The section paved with catalytically blown asphalt-blend mix has cracked more than the one paved with regular Massachusetts Type I mix. Longitudinal cracking occurred mostly over the edge of the concrete slab next to the median strip.

Since asphalt pavements change character with age, these results must be considered as tentative only. Subsequent development may lead to modifications.

• • •

Steel Swimming Pool With Diatomaceous Filters

For the coming season, Berlin, Wisc., will have a new 50 by 100-ft. steel swimming pool, replacing an unsatisfactory pool built back in WPA days. The steel tank is of 1/4-in. plate and the entire unit is welded, the scum gutters being rolled to shape and welded on. Maximum depth is 10 ft. and minimum depth is 2½ ft. Water capacity is 195,000 gals. The water is filtered through diatomite filters and chlorinated, using chlorine gas.

For protecting the steel, the following procedures were employed: The outer and under surfaces were cleaned of all rust and dirt, primed and given two coats of asphaltic type paint. Special consideration was given to those inaccessible areas where subsequent welding might burn off or injure the paint. The interior of the pool was sandblasted and two coats of primer applied, after which two coats of a special rubber base enamel were placed. To facilitate night use, 18 underwater lights were installed.

The pool, which will accommodate 190 bathers at one time, will cost about $65,000 complete. Contract for the bathhouse was awarded last fall and, with the pool, will be ready for the 1955 season. In the near future a wading pool will also be built. William L. Sherburne is city engineer.

"WE CAN EXPECT THE MOST FOR OUR DOLLAR"

J. C. COUGHLAN, Supt., Dist. No. 3
Nevada County, California

Up in the old-time gold mining country of California, Nevada County has 111 miles of hilly roads to maintain. Cat® equipment does the job.

The D8, with No. 8A Bulldozer, shown above, is widening and straightening a mile-long stretch of road where logging trucks and sharp curves had caused a traffic hazard. This big yellow tractor does most of the heavy pioneering and rough grading, as well as clearing a lot of snow in winter. In addition the district uses a Caterpillar No. 12 Motor Grader and an HT4 Shovel.

Superintendent Coughlan says: "We have found Cat equipment the best that can be owned. Our D8 has operated nearly 5000 hours without any major repairs — all in rough country. The same goes for all our Caterpillar machines. We can expect the most for our dollar out of them."

Like all Caterpillar units, the D8 is built with extra ruggedness to stand up under tough conditions and deliver years of trouble-free work. Your Caterpillar Dealer backs its long life with prompt, reliable service and genuine parts. Ask him for an on-the-job demonstration and solid proof that the machines he sells can save money for your taxpayers.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

HOW TO: slash base construction costs . . . raise load-bearing standards . . . save thousands of maintenance dollars with the BIG NEW 1955 SEAMAN

Idaho. High densities are obtained in soil-cement construction with the SEAMAN Self-Propelled Mixer. Here the SEAMAN is mixing, blending and assembling aggregates and mixing in the water increment.

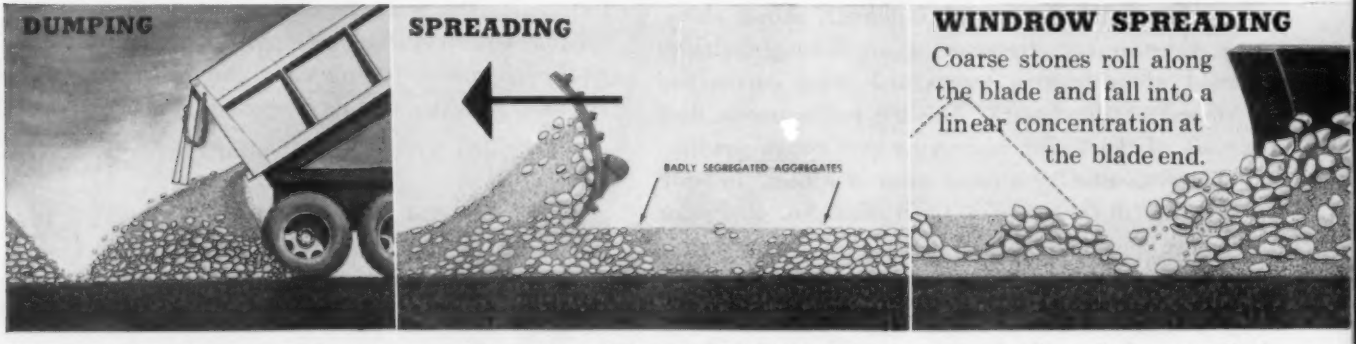
Compaction roller follows immediately behind SEAMAN TRAV-L-PLANT. The SEAMAN finishes to fine grade and crown leaving mix ready for final rolling.

In every field of stabilization, with any material, any binder . . . whether for base, sub-base, shoulder or wear course . . . the SEAMAN MIXER —

SLASHES ORIGINAL CONSTRUCTION COSTS. The PULVI-MIXER attains a thoroughly blended and proportioned mix by the proper mechanical assembly of aggregates and fines, and does it in less time at higher daily output. Consequently the square yard cost for mixing and compaction is drastically cut.

RAISES LOAD-BEARING STANDARDS. Because the PULVI-MIXER in its assembly of materials, keys and interlocks the aggregates and fills the voids with fines to securely mortar-in the larger stone, compaction produces a denser, more tightly knit course, which supports a much higher traffic load.

SECRET OF SEAMAN *(below)*



When gravel is dumped, it forms in piles. Larger stone falls first, the fines last. This segregated condition is highly unstable.

When those piles are leveled alternate pockets of fines and coarse are formed. A base so constructed will soon ravel and break up.

In spreading windrows to final grade fines are concentrated in the windrow "heart." Some fines remain as a pocket, others sift to the bottom. Such segregation also is very unstable.

with 51 improvements!

The SEAMAN Self-Propelled TRAV-L-PLANT. 7 ft. mixing width. Gasoline or diesel powered. Equipped with pump, tachometer assemblies, volumetric meter and spray bar for application of bitumens or water.

PULVI-MIXER

SAVES MAINTENANCE DOLLARS. Stones or aggregates of any size when mortar-locked by the SEAMAN-process are highly immovable, consequently resist moisture penetration and the ensuing damaging effect of traffic. This is true whether the course be simple gravel stabilization or of a higher type employing any of the many available binders. A SEAMAN constructed base or sub-base stands without spring break-up, without raveling, washboarding or maintenance requirement.

EARTH FILLS AND EARTH DAMS. Those same SEAMAN principles, — the elimination of voids, and the blending of soils produce densities in earthwork that range 95% to 100%. Very important is the inter-mixing of the various soil types found in fill material so that uniform reaction to moisture and compaction will result.

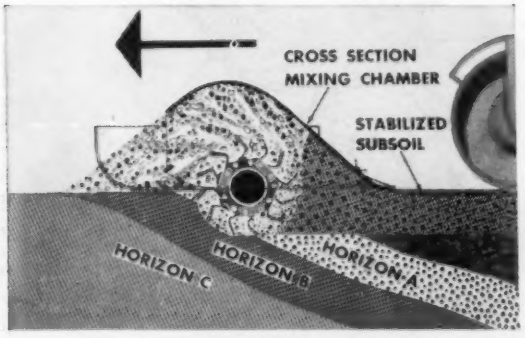
SEAMAN TRAV-L-PLANT in bituminous city street construction.

SEAMAN MOTORS, Inc.

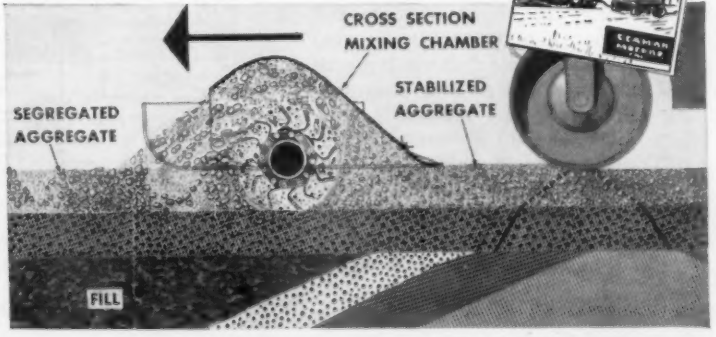
266 No. 25th St., MILWAUKEE, WIS.

A description of the SEAMAN MIXER and the work it does is detailed in this recent BULLETIN. A postcard request will bring it to you — rush. Just ask for Bulletin TPS.

MIX STABILITY



Here the PULVI-MIXER stabilizes sub-base by blending soil horizons (A, B, C) to attain uniformity in moisture, density and thickness. This prevents sub-base failure.



Here the SEAMAN processes aggregate for the base, correcting by proper assembly of materials, an always-present segregated condition. The coarse material is keyed and interlocked, voids are filled with fines to securely mortar-in the larger aggregates.

Now's the time to mail this month's Reader's Service card.

PUBLIC WORKS DIGESTS

The INDUSTRIAL WASTE *Digest*

Machine Shop and Foundry Wastes

Chevrolet Motor Div. operates at Tonawanda, N. Y. an automobile engine plant, forge plant and foundry. The principal liquid waste from the engine and forge plants is oil; that from the foundry is a black slurry. The oil wastes from the former are of both the emulsified and floating type. The waste from the foundry includes fine sand, sea coal, graphite, oxides of metal, and clay, washed out in reclaiming the molding sand. Waste water from the engine and forge plants is passed through oil separators, and then mixed with aluminum sulfate and sulfuric acid. Gravity separation of floating oil and floc is accomplished by passage through a tank with a surface baffle at the effluent end. The effluent from this is treated by flocculation and flotation with the aid of air previously dissolved in the water compression. Scum from this unit combined with that from the separator is treated with sulfuric acid and heated almost to the boiling point, when the oil is liberated and rises to the surface. Waste from the foundry is settled in a tank for about 1 hr., and a large part of the effluent is recirculated to the foundry. The remaining effluent is passed to a tank with a conical bottom where the sludge settles, and a down-flow center coagulation zone containing a paddle flocculating unit and provision for adding coagulating chemicals. The sludge is further dewatered on a vacuum filter.

"Treatment of Machine Shop and Foundry Wastes." By C. W. Hathaway and R. E. Harvie, Metallurgical Dept., Chevrolet Motors Div. *Sewage and Industrial Wastes*, November.

Activated Sludge For Paper Mill Wastes

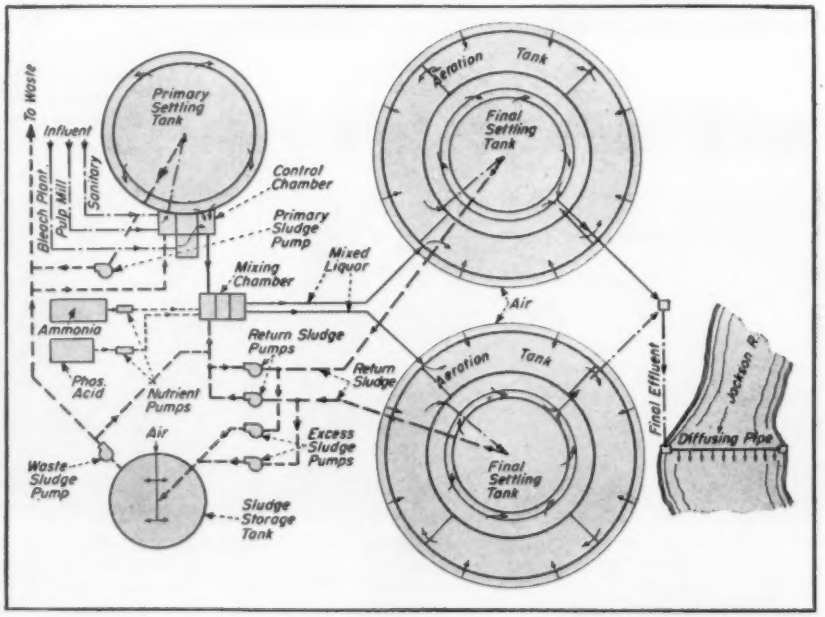
The first large-scale activated sludge plant for treating wastes from the kraft pulping process is being constructed for the West Virginia Pulp and Paper Co. at Covington, Va., on the Jackson River, a small stream, the flow of which, during low flow periods, consists mainly of mill effluent. Studies which led to the adoption of this process began soon after World War II and have included the operation of a pilot plant for two years. Operation of the pilot plant revealed that BOD, chemical oxygen demand and color could be reduced by 94 percent, 72 percent and 43 percent respectively at loadings of 75 lb. of BOD per day per 1,000 cu. ft. of aerator capacity. The wastes treated consisted mostly of complex organic compounds, such as lignin, carbohydrates and resins.

The plant now nearing completion was designed to treat 8 mgd from the pulp mill and 8.2 mgd from the bleach plant. Bleach plant wastes will flow to an acid-proof mixing compartment. Pulp mill wastes, after flowing through a primary settler, will flow to the same compartment, neutralizing the acid bleach plant wastes. The combined flow will then pass through an activated sludge plant, a feature of which is the combination of aerator and final settling tank in one circular structure, the aerator surrounding the settling tank. The effluent will be discharged into the river through a submerged distribution pipe laid across the stream with numerous outlets, providing rapid, uniform dilution. Excess sludge will be pumped to a storage tank equipped for aeration, and from this to the primary settling tank; the sludge from which will be disposed of in a fly ash lagoon.

"Waste Works Points Way for an Industry." By W. Wesley Eckenfelder, Jr., and Theodore L. Moore, whose firms cooperated in the designing. *Engineering News-Record*, Dec. 2.

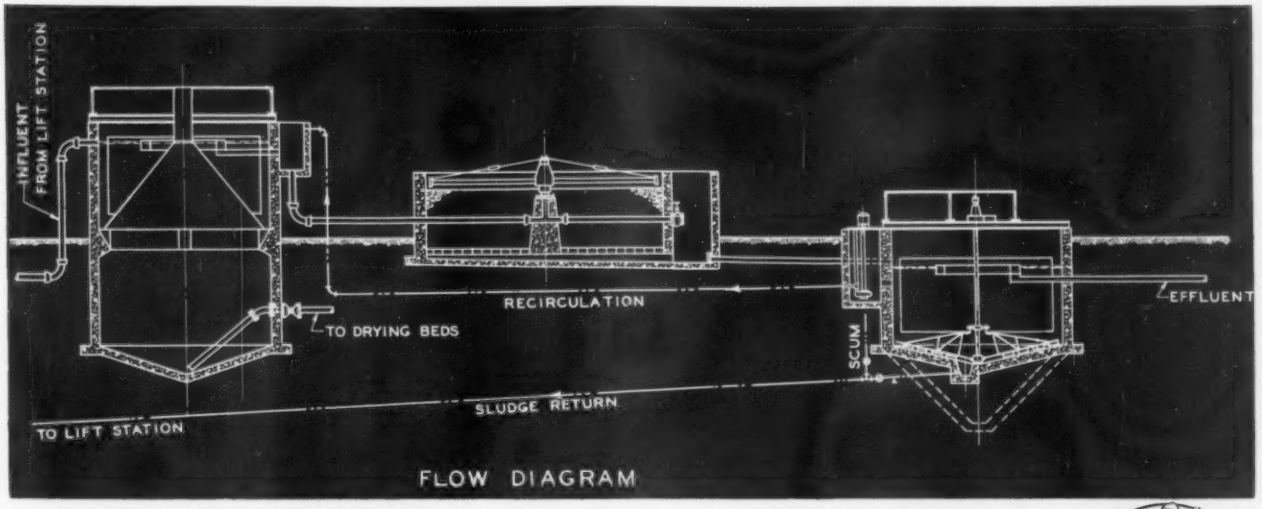
Charges For Municipal Treatment

Industries producing liquid wastes which must be treated can adopt one or both of two general meth-



Courtesy Engineering News-Record

● **APPLICATION of the activated sludge process for treating paper mill waste.**



YEOMANS
Spiragester

Combination clarifier and sludge digester—for primary and secondary treatment—is securing results like these:

45% Removal of B.O.D.—65% Removal of Suspended Solids—

100% Removal of Settleable Solids.

Solids removal is accomplished in the upper portion of the Spiragester by spiral downward flow of the influents introduced tangentially into an annular race, and enters clarification compartment at bottom. Diffusion is slow, uniform.

Settled solids in the clarification section enter the digestion compartment, mix actively with digesting material and are attacked by organisms which stabilize the sludge.

In the layout illustrated, secondary treatment is provided by a high capacity trickling filter and by a Spiraflo clarifier.

Ask for Typical Case History Performance Data. See your local Yeomans representative listed in the Yellow Pages of your telephone book under "Pumps," or write factory direct.

Yeomans Brothers Company, 2000-2 N. Ruby Street, Melrose Park, Illinois

Manufacturers of: Distributors • Clarifiers • Digesters • Mechanical Aerators • Pneumatic Sewage Ejectors • Centrifugal Pumps

ods — discharging the wastes untreated into municipal treatment plants; or each giving its own waste sufficient treatment to permit discharge into a sewer or directly into a diluting stream or other final disposal. If it is discharged, either raw or partly treated, into municipal sewers, the municipality generally expects to be paid for treating it. In fixing the amount to be paid, there are four general methods in use. Flat Rate; Quality-Quantity; California Formula; and Joint Committee Formula.

Flat rates are based on a fixed charge per unit, which unit may be volume of production, floor space, water used, or other. This is especially suitable for small municipalities. Q-Q rates take into account the quantity of waste and also the concentrations of suspended solids, BOD, chlorine demand and others. This method requires special factors for each case; such have been developed by Buffalo, New Brunswick, N. J., Allegheny County, Belleville, Ill., and University of Texas. The method is easy to apply, but it is difficult to develop an equitable formula. This is suitable for larger cities; as are also the California and Joint Committee formulas. The last named is quite complicated and difficult to apply.

"Rate Formulas for Industrial Wastes." By James M. Symons, graduate student, M.I.T. *Water & Sewage Works*, December.

Analyzing the Smog Element

It is well known that public health hazards are created by the liberation to the atmosphere of toxic oxides of nitrogen resulting from using explosives, in welding operations, operating internal combustion engines, and various chemical processes. Nitrogen dioxide is the most toxic of these and is believed to play a vital role in the creation of irritating smog. The proposed maximum safe concentration is 5 ppm, which presents the problem of detecting small concentrations. Previously available analytical methods are unsatisfactory. Investigations have resulted in the development of a reagent which is specific for nitrogen dioxide and can be used for continuous sampling. The reagent, a mixture of sulfanilic acid, N-(1-naphthyl)-ethylene diamine dihydrochloride, and acetic acid, will absorb nitrogen dioxide efficiently in a midget fritted bubbler at levels below 1 ppm. The method produces a stable color which can be measured visually or spectrophotometrically. It has a sensitivity of a few parts per billion for a 10 minute sample collected at a rate of 0.4 liter per minute. Slight interference is experienced from other gases, but this is subject to some control.

"Colorimetric Microdetermination of Nitrogen Dioxide in the Atmosphere." By Bernard E. Saltzman, Division of Special Health Service, U. S. Department of Health, Education, and Welfare. *Analytical Chemistry*, December.

Microorganisms in Sulfide Wastes

The solution of minerals in acid mine drainage has been attributed to the action of sulfuric acid on minerals and the production of the sulfuric acid by atmospheric oxidation of sulfuritic materials. Some observations have indicated this to be a microbial process. By using organisms obtained from the leaching stream issuing from waste rock dumps in Bingham Canyon, Utah, the solution of iron and copper from various sulfide minerals and the accompanying production of sulfuric acid was shown possible. Minerals employed in the studies were pyrite, chalcopyrite, covellite, chalcocite, bornite, and tetrahedrite. Further studies involved the reagent grade copper sulfide and float concentrate from the mining operations in Bingham Canyon. The process was shown to be one of oxidation by microorganisms which are able to grow in the presence or absence of iron-containing minerals. It is thought that the bacteria probably derive their energy by the oxidation of lower valent sulfur to sulfate, forming soluble sulfates of iron and copper and sulfuric acid where excess sulfur is present.

"Microorganisms in Leaching Sulfide Minerals." By L. C. Bryner, J. V. Beck, D. B. Davis, and D. G. Wilson, Brigham Young University, *Industrial and Engineering Chemistry*, December.

Public Control of Radiation Emitters

The Atomic Energy Commission licenses users of reactor-produced radioisotopes and other radioisotopes subject to its jurisdiction before such users are permitted to receive the materials. The A.E.C. is authorized to establish regulations, having the force of law, violation of which may subject the offender to fine or imprisonment.

Other Federal agencies control the transportation of radioactive materials in interstate commerce, and application of such materials to food or drugs. The Public Health Service is engaged in studies of radiation problems and is encouraging the development of State radiation health programs.

State health personnel make joint inspections with AEC representatives and conduct independent inspections of users of AEC-controlled radioisotopes. Although some State agencies have failed to exercise to the fullest extent the powers invested in them, others have made remarkable progress in recent years in acquiring competent personnel and developing effective inspection and educational programs.

Despite the increasing availability and use of radioactive materials, the radiological health picture in the United States is good. It is believed that continued cooperation among all agencies involved, whether Federal, State, or local, is the best insurance that this picture will continue to be good. Caution, even extreme conservativeness, has been the keynote in the development of atomic energy. Fortunately, this has been one field in which public health controls have kept pace, and they can continue to do so, with the increasing scope and growth of the industry.

"Public Control of Radiation Emitters." By Gerald L. Hutton, LL.B *Public Health Reports*, December, 1954.

Economical Solutions To Industry's Waste Problems

Establishing a waste control program necessitates a knowledge of the magnitude of the plant load, which includes direct waste resulting from chemical reactions, and indirect waste resulting from spills, leaks, drips and generally sloppy operation. Wastes from indirect losses have been found to run as high as 20 percent. By careful and thorough study, open-mindedness, and close cooperation by process and waste engineers, economical solutions of these problems can be developed. Illustrations of this are cited in the article. It is not intimated that a treatment plant can always be eliminated, but it certainly can be reduced in size and cost, and waste treatment is expensive. The regulatory agency should allow the necessary time to an industry which is honestly striving to accomplish a solution of the problem.

"Waste Control Begins With Process Operations." By B. W. Dickerson, Hercules Powder Co. *Sewage and Industrial Wastes.* December.

Reducing Water Costs at Electronics Park

Electronics Park of General Electric Co. in 1951 used 490,000,000 gal. of water, which cost it $79,325. To reduce this cost as well as to conserve the water supply, the company has a program under way to reduce consumption by setting realistic water requirements for the various operations; installing controls to regulate the flow of water only as needed; recirculate and reuse water where economical; and provide water softening and deionizing equipment and boiler water treatment. By this program the company has reduced water costs by more than $100,000 a year below the $150,000 that would otherwise have been required for the output produced in 1954.

"Water Conservation and Wastes Control at Electronics Park." By Wallace B. Miller and Vincent deP. Lukas, General Electric Co. *Sewage and Industrial Wastes,* December.

Paper Mill Wastes for Irrigation

The Southland Paper Mills discharge waste water averaging about 18 cfs into a stream with a normal winter flow of 1,000 cfs but which falls as low as 10 cfs in summer. Studies of treatment methods have included biological and lagoons. It is now studying the possibility of irrigation. Two 5-acre test areas are being used, one of sandy soil, the other of tight bottomlands. One half of each is left unirrigated as a control. Both halves were planted with Kobe lespedeza. During the first year of operation the seeding was late and a crop of weeds and grasses got control; but they expect that in future, 2 or even 3 cuttings of dense stands of the planted crops will be possible.

"Southland Paper Mills Waste Treatment and Disposal." By Fred W. Bishop, Southland Paper Mills, and J. W. Wilson, Texas State Dept. of Health. *Sewage and Industrial Wastes,* December.

Other Articles

"Chemical and Biological Processes for Treating Industrial Wastes". Abstract of papers before the Federation of Sew. and Ind. Wastes Assn. Wastes Engineering, December.

"Local Government Initiative in **"Trade Wastes Salvage"** in England. By A. L. Thorogood. Municipal Engineering, Oct. 29.

"England Studies Biological **Treatment of Cyanides"** from gas works and cotton kiering. Wastes Engineering, December.

"Industrial Sewer Modifications to Reduce Pollution". By Carl J. Swartz, Chf. Chemist, L. F. Grammes & Sons. Sewage and Industrial Wastes, December.

Accident Reduction in a Water Department

Accident prevention has been given a prominent place in the operations of the Long Beach, (Calif.) Water Department. Whereas the accident severity ratio for 1952 was 0.37, it was 0.32 in 1953 and only 0.02 for the first six months of 1954.

Cost of Water in Pasadena

For the year ended June 30, 1954, the cost of water per 100 cu. ft. to Pasadena, Calif., was as follows: Production 4.52 cents; transmission and distribution 0.98 cent; commercial and general 2.67 cents. In percentage terms, production amounted to 29.31 percent of total expense and transmission and distribution were 5.45 percent. Total cost per 100 cu. ft. was 15.42 cents.

PUBLIC WORKS DIGESTS

The WATER WORKS *Digest*

Effect of Filtration On Radioactivity

Measurements of radioactivity in reservoirs of the Troy, N. Y. water works were made during and following the AEC nuclear weapons tests in Nevada in 1953. (The activity lingered in the atmosphere for at least 2 months after the tests ended.) Tests were made of the activity of rain, stream, reservoir and the rapid sand filtration plant. Also of dissolved and suspended solids, algae, rock scrapings, higher plants, and bottom soil. Analyses of water and sludge from the treatment plant showed that about 35% of the raw water activity was removed by the filters. It should be noted that the water has a relatively high concentration of manganese, of which 80-90% is deposited on the filter sand, which may account in part for the removal of fission products. No removal of fission products by aeration and sedimentation could be detected. Storage of the filtered water in uncovered distribution reservoirs resulted in a return of the fission products concentration to practically the same as in the raw water.

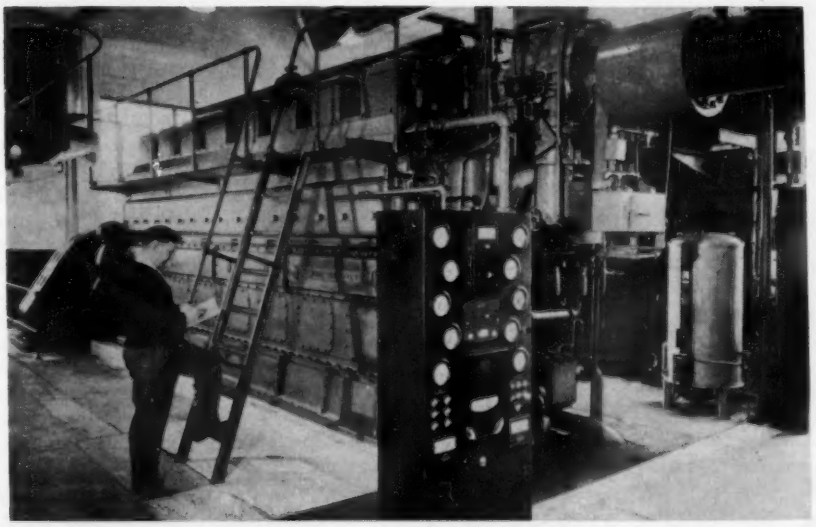
"Measurement of Radioactive Fallout in Reservoirs." By E. J. Kilcawley, H. M. Clark, H. L. Ehrlich, W. J. Kelleher, H. E. Schultz, and N. L. Krascella, Rensselaer Polytech. Inst. *Journal, AWW Ass'n,* November.

Elbows as Water Meters

Some engineers have considered the use of an elbow in a pipe line as a meter, since the centrifugal effect of liquid flowing around a curve is to produce greater pressure against the outer side of the elbow than against the inner side, the difference in pressure having a definite relation to the speed of flow and therefore to the volume. This difference can be measured by piezometers placed on the inside and outside of the curve, radially opposite. each other. The head-discharge relationship is a function of bend and cross-section radii and is affected by the location of piezometer tape, upstream and downstream piping, surface roughness and probably other factors. The author presents theoretical developments of formulas for expressing head-discharge relationship, and also the results of tests, using both 45° and 22.5° taps, and concludes that there is a large discrepancy in the results of different investigators using 45° taps, but reasonably good correlation with 22.5° taps; the influence of upstream and downstream piping is apparently negligible. A distinct, reliable relationship will be obtained for a given installation, but a high degree of accuracy can normally be assured only when the meter is calibrated in place, in which case the error probably will not exceed about 2-3 percent.

"Elbow Meter Performance". By Donald C. Taylor, Mass. Inst. of Tech. and Murray B. McPherson. Lehigh Univ. *Journal, AWWA,* Nov.

Dual Fuel Engine Cuts Fuel Costs 27.8%



A NEW dual fuel engine—the latest addition to the municipal power plant of Le Sueur, Minn.—has cut fuel cost 27.8%. The engine is a Worthington supercharged, 1300-kw dual fuel Diesel-electric unit which went into service during the first quarter of 1953. For the following nine-month period the engine generated 73.1% of the total output, or 4,383,350 kilowatt hours. For this period, fuel costs averaged 5.2 mills compared to 7.2 for the preceding period—a saving of $9,-766.90. Merle D. Geving is superintendent.

Radioactivity Of Precipitation

On March 17, 1953, the Atomic Energy Commission began a series of nuclear weapons tests. For 12 months beginning with March, a study was made of the radioactivity of precipitation in the Cincinnati, Ohio, area. Two days after the first test there was a sharp rise in beta activity of the rain, and it increased until the end of the tests, after which the activity again decreased. During the tests the radioactivity in the rain varied from 280 to 319,000

micromicrocuries per liter, as compared with 50 before the tests.

"Radioactive Fallout in Cincinnati Area". By J. S. Nader, A. S. Golden and L. R. Setter, from R. A. Taft San. Eng. Center, Cincinnati. *Journal, AWW Assn.*, November.

Aquatic Growths In Reservoirs

Methods of controlling such growths employed by the cities of New York and Los Angeles are described in detail by Benjamin C. Nesin, Director of Laboratories of New York, and Ray L. Derby, Principal Sanitary Engineer of Los Angeles. In New York, recent taste and odor conditions were largely attributable to *Synura*, but since 1947, superchlorination has proved completely effective in controlling it in the Croton supply, and the continuous application of small doses of chlorine and copper sulfate are effective in the Catskill-Delaware supply. The procedure has been developed by years of full-scale experimentation, which is still continuing. It was learned, for example, that when copper sulfate was used alone, 0.24 ppm sufficed to destroy *Synura* growths containing as high as 2,500 standard areal units per milliliter. With 2 ppm of chlorine it was possible to destroy *Synura* and any aftertaste within a short period. Superchlorination of the Croton supply has eliminated the uncertainties and inconveniences of surface treatment and facilitated other aspects of taste and odor control. In the laboratory, certain types of fine screening have given results equal to those obtained by copper sulfate treatment, but this method is impracticable at the present state of technological development.

Mr. Derby in his paper considers methods and innovations that have been employed with more or less success by San Diego, Los Angeles and other western cities. These include unusual methods of applying copper sulfate; control of cattails, pondweeds, plankton, and taste and odors, using a constant residual of copper sulfate in some reservoirs, chlorine in others.

"Methods of Controlling Aquatic Growths in Reservoirs". A joint discussion. *Journal, AWW Assn.*, November.

Use of Water Filterability Test

At the water filtration plant of Hamilton, Ontario, a two-year study has been made of water filterability as correlated with plankton content, actual filter runs, and other variables. The apparatus employed for determining the filterability index includes a microscreen ½ in. in diameter as filter membrane. The index is a measurement of the total amount of particulate matter in the water and varied from 0.0 for perfectly clean water to a maximum of approximately 3.0 when the water in the reservoir reached its maximum plankton density. Continuous yearly records of the index provide valuable information in assigning causes for variations observed in the performance of the plant filters. The index determination can be made more quickly than plankton counting, and correlates better with plant performance. The apparatus used is described in the article.

"Improved Water Filterability Test". By D. H. Matheson, Supt. *Water and Sewage Works*, December.

Water Supplied Through Two-inch Plastic Pipe

A recreation area on Grandfather Mountain, in western North Carolina, was provided with water that

flowed by gravity from a spring into a reservoir at elevation 5,280. When this spring dried up it was necessary to obtain another supply as soon as possible. The nearest practicable source was a spring 8,800 ft. away, elevation 5,300, with a steep and rocky terrain in between, inaccessible for trucks. To solve the problem, the manager of the area bought 10,000 ft. of 1-in. Perma plastic pipe in 500-ft. coils, each weighing 100 lb. A helicopter dropped these at stations 500 ft. apart, all 20 of them in 2 hr. and 20 min. Men located at these stations connected each coil to the preceding one and uncoiled it to the next station. Due to the steep slopes, it was necessary to anchor the pipe at several places. At one point there is a 1360-ft. head on the pipe, but there has been no break; except when a bear bit a piece out of the pipe. The pipe is laid on the surface, and to prevent freezing it was proposed to drain it about Nov. 15.

"Helicopter Delivers 8,800 Feet of Pipe for Mountain Resort". By Joseph O. Fortin. *Water Works Engineering*, December.

Water Supply Transforms a County

Until 1940, DeKalb was a poor agricultural section of Georgia. Then some courageous and forward-looking citizens started a new water plant with a view to getting water for a parched back country in which there were few people because it was not comfortable to live there. When water began to be distributed to all parts of the county, the project snowballed until now an abundant supply of good water has made it a good county to live in.

"Water Made DeKalb County." *Public Works*, January.

Other Articles

"Selection of **Valves** for Waterworks Service". By Leslie Paul, Engr., East Bay Munic. Utility Dist., Journal, AWW Assn., November.

"**Water Quality Criteria** and Municipal Supplies". ("Criteria are a means of forming judgment.") By W. W. Towne, U.S.P.H.S. Journal, AWW Assn., November.

"Engineering Studies on **Amebiosis Outbreak** at South Bend." Details of methods employed in making the investigation. By George G. Fassnacht, Indiana State Bd. of Health, and Jack H. Fooks, U.S.P.H.S. Journal, AWW Assn., November.

"Modern Water Treatment plant for a **Small Community**" By J. Wiley Finney, Jr. Public Works, January.

"**Austin** Had Water Last Summer," by means of a plant opened in July. By A. H. Ullrich, Supt. Public Works, January.

"**Water Meters** May Be Used as an Index to Growth of Cities". More than a dozen instances of such use are described. Public Works, January.

"How We Remodeled an Old **Filter Plant**" at Waynesburg, Pa., replacing wooden units with steel ones. By G. E. Martin, Mgr. of water company. Water & Sewage Works, December.

"**Pumps**—Application and Operation". By George E. Symons, Water & Sewage Works, December.

"**Elementary Chemistry** for Water Works Operators". By Martin E. Flentje. Water Works Engineering, December.

"Designing, Constructing and Maintaining **Centrifugal Pumps**." By Roy Carter and Igor J. Karassik, Worthington Corp. Water & Sewage Works, December.

"Determining Applicability of **New Materials** to Water Works." By Russell W. Henke, Badger Meter Co. Journal, AWW Assn., December.

Now's the time to mail this month's Readers' Service card.

Algae Control

(*Continued from page 87*)

A number of important precautions should be noted. Avoid spraying on or near minnow traps or live boxes because the momentary high concentration may be sufficient to cause fatalities. Be alert to avoid over-dosing if difficulty is encountered with boat or spray unit. Avoid spraying on painted buildings, boats, and piers that will be stained by the chemical. Finally, if the pump and piping are not fabricated of copper-resistant materials, flush thoroughly by pumping lake water through them before stopping operations, even for a temporary period.

Field and laboratory studies have shown that fish are not killed by copper at concentrations normally used for algal control, that the fishing and fish yields of lakes treated as long as 26 years have not deteriorated, and that accumulations of copper in the bottom of the most-treated lake in the country, Lake Monoma, Madison, Wis., have not destroyed its ability to produce and support bottom-dwelling organisms that serve as fish food.

The use of copper sulfate is not foolproof, and the margin between a safe and satisfactory treatment and one that may destroy fish or cause other harm sometimes is not very great. For this reason, chemical treatment activities should be entrusted only to technically trained persons fully familiar with potential hazards and able to take the necessary precautions. Consideration of these points has led either to specific legislation or to State supervision of chemical treatment in such States as Wisconsin, Minnesota, and Michigan.

A systematic search has been made for a more desirable algicide and preliminary tests with one compound (2, 3-dichloronaphthoquinone) show that it holds promise as a more selective algicide for blue-green algae, which most commonly cause nuisance blooms in lakes. It apparently has no immediate toxicity to other organisms and does not accumulate. It has not yet been used on a large scale. The algicidal properties of certain antibiotics are under study also.

Characteristics of Water Weeds

Like algae, water weeds have many values when the crop is not excessive. In addition to contributing to the natural appearance of bodies of water, vegetation serves as food for many animals from insect larvae to muskrats, beaver, deer, moose, and waterfowl; as cover and breeding places for fish; as a stimulator of natural purification; and potentially as mulch and food for farm animals.

On the other hand, excessive vegetation interferes with bathing and other recreation, fishing and fishery management, pleasure boating, and commercial navigation. It limits the flow in irrigation canals and drains, depreciates waterfront property, contributes to winterkill of fish, and supports mosquito breeding. These are the reasons why waterfront property owners and improvement associations seek methods that will give relief.

Growth of water weeds is influenced by light penetration, availability of nutrients, and temperature, in much the same ways as is algal growth. In addition, some plants are dependent on suitable bottom material and depth of water. Although most plants propagate by means of seeds, many have accessory propagation abilities by rootstocks, tubers, winter buds, and plant fragments. These facts suggest physical control methods that

may be used and explain some of the difficulties that arise.

Physical Control of Water Weeds

Physical control of water weeds includes both mechanical and nonmechanical methods. Many mechanical methods and equipment, such as hand raking, dragging chains, pulling cables, underwater saws, power mowers, a puller and baler, and a cutter and baler, have been used with variable success. Notable disadvantages of some of these methods are oxygen depletion from decaying weeds, development of stockier weed growths, and rooting of cut fragments. These methods do, however, offer the advantage of quick action and are suitable for opening isolated channels.

Machines have been developed to remove the plant mass after either pulling or cutting. They eliminate many of the disadvantages of simple cutting, such as oxygen depletion and attendant fish kills, odors of decay, and the nuisance of wind-driven windrows of rotting weeds concentrated along shorelines. They also remove nutrients in the form of cut weeds which eventually may limit both nutrients and weed growth.

Of the many nonmechanical methods that have been used, two are sufficiently novel to be of interest. Both represent attempts to produce environmental conditions that limit photosynthesis. In one case, the water is converted into weak ink by adding a black dye called nigrosine. The method thus far has been only partially successful. The dye is nontoxic to fish but has the disadvantage of making the water unattractive until natural forces cause the dye to fade. In the other case, light penetration is decreased by heavy blooms of algae that are stimulated by intentional addition of fertilizer. Although the method has been used with some success, the stimulated blooms of algae may themselves be equally objectionable.

Chemical Control of Water Weeds

During recent years, a large variety of chemicals have been used for control of submerged aquatic plants. Among them are hydrocarbons such as orthodichlorobenzene, trichlorbenzol, dichlorbenzol, and naphtha; hormone weed killers such as 2,4-D and 2,4,5-T; and

other compounds such as sodium chlorate, ammonium sulfamate, copper sulfate, and sodium arsenite. None can be considered an ideal aquatic herbicide for general use.

The chlorinated hydrocarbons and naphtha, while effective under proper conditions, are so highly toxic that they will kill fish and their food before controlling vegetation. Ammonium sulfamate and the 2,4-D's are too expensive for use on submerged plants. Sodium chlorate is suitable for muskgrass but will kill fish and fish food at weed-killing dosages.

Sodium arsenite is considered one of the cheaper, safer, and more effective chemicals for use in recreational areas. So far as published records go, it was first used for this purpose 30 years ago in the Madison, Wis., lakes and has since been adopted for use in fishery management. It is now widely used, especially in the midwest. But because of its toxicity, proposals to use it should be considered with extreme care and State Health, Conservation and Agriculture Departments should be consulted.

Mainly on the basis of field experience, effective dosages under various conditions are quite well known. Although concentrations as low as 1 ppm (white arsenic equivalent) will affect plants after a sufficiently long exposure period, application rates in practice must compensate for arsenic losses by diffusion, wave action, and absorption by vegetation and bottom mud. Rates commonly used range from 5 to 10 ppm, with material costs from about $2 to $4 per acre-foot.

For small areas, the chemical can be applied underwater by gravity feed lines draining a solution tank. Spraying equipment similar to that used for algal control is suitable for large-scale operations. Treatment should be from the shoreline outward, first along lanes of travel parallel to the shore, and then at right angles to it so as to crisscross the area in two directions. Attempt should be made to regulate dosage relative to depth.

Generally, 5 to 10 days are required for death and collapse of plants. Seeds are not appreciably affected. Dead plants turn brown, generally sink to the bottom and decompose, but with rough water some may be torn loose and float to the surface. Such floating vegetation should be removed from the water to avoid development of nuisance conditions. The duration of relief following treatment is determined by a number of factors.

Notable are the relative size of the treated area to the total area of weed growth and, within it, the effectiveness of kill. In most cases, treatment must be made during two or three successive seasons to obtain relief of several years' duration.

The toxicity of arsenic and causticity of the solution make necessary a number of important precautions. Cattle and other grazing animals should be excluded from the treated area for at least 3 days following treatment. Care should be exercised to avoid spilling or spraying the solution on flowers, shrubbery, trees, or other vegetation—especially where grazing may later occur. Water should not be used for bathing or stock water for at least 3 days. Rubber gloves and protective cream or a face mask should be worn by the operator, and direction of boat travel should be such as to avoid wind-blown spray that will cause skin burns.

Field and laboratory tests show that there is a fairly wide margin of safety for fish and fish foods when using arsenic. In laboratory aquariums, critical concentrations for various kinds of fish over a 10-day period range upward from about 10 ppm As_2O_3. Fish food animals vary widely in tolerance; mortality rates for chironomids, mayfly nymphs, and freshwater shrimp may be high at 2.5 to 4.0 ppm, whereas damselfly and dragonfly nymphs, sow bugs, and water mites survive concentrations of 10.5 to 21.0 ppm.

Hazards to aquatic organisms during and after treatment are less serious than the laboratory data suggest. Most fish and some fish food animals are repelled by the chemical and move into untreated water. Diffusion, wave action, and absorption by the vegetation and bottom mud progressively reduce the concentration. Hazards are greatest when large masses of decaying vegetation deplete dissolved oxygen. This can be avoided by initiating treatment when the plants are young and growing vigorously or by temporarily leaving areas untreated if control procedures are not initiated before the vegetation becomes dense.

The history of water weed and algal control, although not well recorded, is marked occasionally by instances of fish destruction. In practically every case they resulted from excessive enthusiasm among untrained operators who apparently felt that if 1 ppm will control algae, 10 ppm should do it 10 times as well. Such unfortunate occurrences reemphasize the importance of limiting control activities to trained technicians only.

Control of aquatic plants is becoming a recognized management tool in the field of water conservation. Frequently it is necessary, if acceptable potable water is to reach the consumer. In other waters, continued recreation, fishery management, navigation, and other water uses that provide pleasure and profit are dependent on it.

Presently available algicides and aquatic herbicides leave much to be desired. Ideal preparations for these purposes should be safe, selective, and economical. The search for them continues, and there is real promise that cleaner lakes can be a reality.

• • •

Cathodic Protection Against Galvanic Corrosion

Cathodic protection is a means of reducing corrosion of metallic structures continuously exposed to salt water or other conductive media. It is used to protect the underwater surfaces of ships, pilings, the inside of salt water ballast tanks, pipe-

lines, and the salt water side of condensers. Galvanic corrosion is the major type of corrosion on surfaces exposed to salt water. It is the result of the passage of an electrical current which flows from one portion of the structure to another through the surrounding sea water, the return circuit being through the metal. This flow of current is caused by a difference of potential which exists between the two affected portions. The continuous flow of one ampere for one year will dissolve approximately 23 pounds of steel or a piece of ½-inch steel plate one foot square. This corrosion becomes increasingly serious when current flow is concentrated at a few locations. When current is forced to flow from an external source to the ship, it is found that the potential of the cathodic portions becomes more negative and approaches the potential of the anodic portions. When these two potentials are the same, no more corrosive currents will flow since there is no voltage to drive it. This condition can be maintained as long as the proper amount of external current is maintained. This is the basic mechanism of all cathodic protection systems. Current can be made to flow to the ship by using materials which are naturally more anodic than steel (magnesium, zinc, or aluminum). When these materials are placed in the water and connected electrically to the ship, current will flow to the ship. This type of system, referred to as the "galvanic anode" system, results in the protection of the cathode (steel plating) and the sacrificial dissolving of the anode material. A second type of system utilizes anodes which are relatively inert and, therefore, permanent. Anodic materials in this case are usually graphite rods. A rectifier acts as the driving source of current. It is necessary that these systems act in conjunction with an applied paint system. Details are available from Office of Information, Navy Department, Washington 25, D. C.

• • •

Interdepartmental Reporting of City Needs

In every city and village there are employees whose duties require that they spend a portion of the day traveling around the community. In the course of their travel they are apt to see things of interest to other of the city or village departments, even though each has a specific job of his or her own to do. As an example, a health department employee might observe a street or

sidewalk defect or a fire hazard which should be reported to the appropriate department for action. Experience in Madison, Wisc., in this respect was reported by H. D. Ingersoll, an administrative assistant to the Mayor of that city, in a recent paper before the League of Wisconsin Municipalities.

In Madison, a form has been developed which is called the "City Services Report." It measures 5½ by 8½ ins., is mimeographed or dittoed on both sides and contains about 75 items. Spaces are available for indicating the person reporting, his department, the time, date, location of condition needing checking and the department to which the form is to be routed.

For example, the section relating to Street Department work covers: (1) Hole in street; (2) hole in sidewalk; (3) loose manhole cover; (4) clogged inlet of storm drain; (5) clogged sanitary sewer; (6) dangerous cross walk curb; (7) areas that are dirty or where debris collects. For the Traffic Engineering Department the items are: Signs—down—mutilated—missing; Signals—bulb out—head turned—traffic delay; Parking—too close to intersection: Parking Meter—not working—bent—missing; Street Light—out.

It has been found that some sort of training is necessary for many employees if the reports they turn in are to be of maximum value. However, the check list used appears to have demonstrated its value.

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Diesel Power

(*Continued from page* 99)

unit was quoted as costing about $100,000 to $125,000. After a study of building costs and similar installations elsewhere in the country, it was decided that if a diesel were purchased it would be installed in a portion of an existing garage adjacent to the electric plant.

After a study of all possible plans, the Council decided to install a 1,000 to 1,200 KW generator and to solicit bids for the equipment. The plans and specifications for the new diesel and switchgear equipment as well as the alterations to the garage were prepared by the Borough Manager and the Electric Plant Superintendent with advisory consultant services being rendered by Klauder Associates of Philadelphia and Charles Tally, Registered Architect. Specifications

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for the equipment provided for either new or used and rebuilt equipment, which had not been operated over 7500 hours. The specifications also provided that either low or high speed diesel equipment could be furnished and that the supplier would be required to furnish and install all equipment. This was considered particularly desirable in order to forestall any possibility of divided responsibility or "buck-passing" if certain equipment did not operate satisfactorily.

Bids were secured from seven suppliers of new equipment on fourteen different sizes and types of engines and from two suppliers of used equipment of five different sizes and types of equipment. After full consideration of all bids, it was decided to award the contract to Baldwin-Lima-Hamilton Corporation for a 1100 KW unit capable of 10 percent overload for a price of $136,750 installed. The cost of the entire installation was as follows: Diesel generator, installed, supplier Baldwin-Lima-Hamilton, contract price $136,750; switchgear, by Roller-Smith, $12,000; garage building alterations, Boileau Brothers, $7,-833; total cost $156,583.

The work contemplated under these contracts has been completed since April, 1954 and the unit was placed in service in May. Since there were remarkably few change orders required under the contract, the entire installation cost the Borough approximately $143 per KW. This compares to a price of $250 per KW quoted with steam. As of October 1st of last year, the diesel has been operated about 600 hours and generated 365,000 KWH. While this unit has not been in operation sufficiently long to give us all the answers as to comparative costs of operation, we know that decided savings are possible depending upon the operating combinations of steam and diesel equipment being used.

Before we had the diesel unit we were required to operate with two boilers at all times including weekends chiefly because our load requirements exceeded the capacity of our 40,000 pounds per hour boiler. Since the diesel is available, we utilize it to supplement capacity provided by one boiler and as a result have noted fuel savings which vary from $22 to $70 per day during the week and from $128 to $160 over a weekend. It is also significant that we have not added to our labor costs and have expended practically nothing for repairs since

the diesel has been installed. However, taking into consideration a reasonable figure for future maintenance requirements and cost of amortization, we have come to the conclusion that the diesel can be operated for a total cost of 11.3 mills including amortization. We also believe it will permit us to reduce our cost of steam generation from the 1.19c per KWH figure encountered in 1953 to about 1.1c per KWH.

The following statement illustrated briefly the fuel savings accruing to us by reason of this change:

Weekday Use: Steam only, Sept. 13, 2800 KW, 47,000 KWH, two boilers required; fuel cost $411.54. Steam and diesel, June 6, 2800 KW, 47,000 KWH, one boiler and the diesel at 700 KW 10 hours; fuel cost for coal $285.36; for diesel $58.10; total fuel cost $343.46.

Week-End Use: Steam only, Sept. 4-5, 1900 KW, 65,000 KWH, two boilers, fuel cost $615.09. Steam and diesel, 1900 KW, 68,000 KWH, one boiler with diesel standby; fuel cost $487.20.

We believe these figures can be improved upon since we are now using premium fuel and lube oil and operating the engine at only about 70 percent capacity. The engine specifications provided that the engine furnished should be capable of operation with either #2 or #4 diesel fuel oil. Until the engine is well broken in it has been decided to utilize #2 fuel oil at 10.06c per gallon and lube oil at 66c per gallon. Even with this high quality fuel, our fuel costs have averaged 8.3 mills per KWH with the diesel as against a coal cost which varies from 8.0 to 8.8 mills per KWH weekdays and 9.0 to 9.5 mills per KWH weekends depending upon what boiler and generator combinations are in use. It might also be of interest to know that the Borough explored the possibility of utilizing natural gas but this fuel is not presently available locally. However, the engine can be converted to dual fuel operation for about $4,000 if such fuel becomes available.

The Borough Council and administrative officials of Quakertown are united in opinion that the installation of this diesel unit has already more than proven its worth and that this type installation must be given serious consideration in future plant expansion programs.

PUBLIC WORKS
EQUIPMENT NEWS

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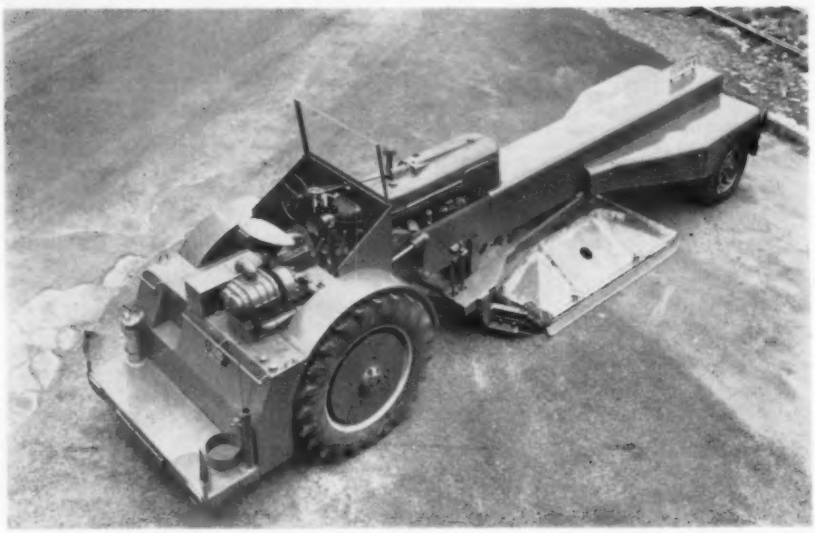
Heater Planer Reconditions Pavements



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This asphalt road heater planer conditions bituminous roads, streets and airport runways quickly, eliminating much costly hand labor. The Littleford-Clarkmoore planer cuts a path as wide as 81 ins., and from a skin cut to a depth of one inch, while moving at a speed varying from 8 ins. to 88 ft. per minute. It has an IHC engine which operates controls and propels the planer; there are five speeds forward; wheel base is 20 ft. and the overall length is 28 ft. 3 ins. Travel speed between jobs is up to 20 mph. Blade action is hydraulic. More from Littleford Bros., Inc., 453 East Pearl St., Cincinnati, O., or circle No. 2-1.

Vibratory Unit Speeds Highway Sub-Base Compaction

Designed for highway sub-base compaction, this vibrotamper will compact material to a depth of 12 to 15 ins., in one or two passes, reducing the bases thickness about 25 percent. It is mounted on crawlers spaced 8 ft. apart and employs six vibrating shoes to cover a 13'2" width, but by removing the two outer shoes, the compacted width is reduced to 8'6", expediting construction on narrow lanes. Compaction efficiency is said to range from 96 to 99.78% Proctor density in two passes. Gross weight of the machines is 5 tons. A 24-page illustrated manual and a color movie are available. International Vibration Co., 16702 Waterloo Rd., Cleveland 10, O., or circle No. 2-2 on the coupon.

Float-actuated flow meter has been redesigned by Minneapolis-Honeywell to meet measurement and control needs of sanitary engineers. It is suitable for measuring flow rates through weirs, Parshall flumes and open channels. It combines recording, indicating and totalizing in a single instrument. It can be used for flow measurements in water and sewage treatment, for measuring sand expansion in backwashing at water filter plants, and for similar purposes.

VINYL RESIN STREET MARKERS EASILY INSTALLED

These vinyl resin street markers are tough and resistant to wear and weather. They are bonded to the pavement without drilling or spikes, a strong adhesive being used. This requires only 2 or 3 minutes to set in hot and dry weather, longer in humid weather. The markers are rectangular, 3 by 6 ins. Simple directions for use and data from Robbins Tire & Rubber Co., Inc., Tuscumbia, Ala., or circle No. 2-3 on the coupon.

Crosswalk marking patterns made with white or yellow vinyl marker blocks

• • •

High Lift Hydraulic Loader and Hoist

The "Economobile" has been announced by American Road Equipment Co., Omaha, Nebr., as a highly useful tractor-mounted hydraulic loader and hoist. It has been used

on construction to handle materials at large savings. It can be equipped with an aggregate bucket for loading concrete bins; with a concrete bucket; with a chain boom for hoisting or placing pipe in a trench; and with a dozer blade for levelling, grading and backfilling. Also available are a tower and a work platform. More from the manufacturer, or circle No. 2-4 on the coupon.

Ateco Front End Loader on Deere Tractor

This loader is mounted on a John Deere 40-C tractor and carries a half-yard bucket for digging and loading dirt and aggregates, and for doing the numberless other jobs that a front end loader is capable of. Other equipment that can be used with it include a scarifier, a fork-

Loader attachment for Deere tractor has 7′ 11″ clearance when dumping load

lift, a ¾-yd. snow or bulk material bucket and a 66-inch bulldozer-backfiller blade. Dumping clearance is just short of 8 ft. Pay load at ground level is 4300 lbs.; at full height 2700 lbs. More from Greenville Steel Car Co., Greenville, Pa., or circle No. 2-5 on the coupon.

Elevating grader attachment for Galion grader folds compactly for transportation

Elevating Grader Attachment for Galion Motor Grader

Easily attachable to the Galion Model 503 motor grader, this B & L elevating grader attachment permits many additional uses of the Galion. It is fine for grading, sidecasting, loading, ditch clean out work and terracing. Of special advantage is the folding mechanism which makes highway transportation possible without a special permit. More from Barnard & Leas Mfg. Co., Inc., Cedar Rapids, Ia., or circle No. 2-7 on the coupon.

The Giraffe—An Aerial Platform for Many Jobs

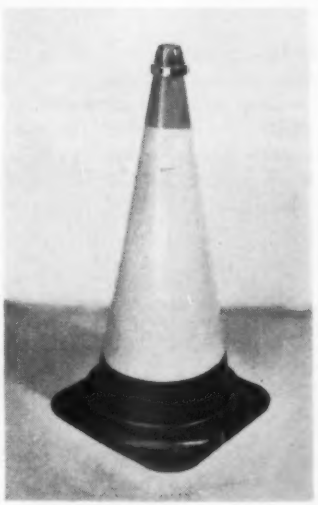
Street light maintenance, tree trimming and overhead construction and maintenance are well cared for with the Giraffe. Operated by its own independent power source, this is sold as a completely self-contained unit that can easily be installed on a truck, trailer, barge or other mount. It can put workmen 40

Aerial platform, the Giraffe, has full hydraulic operation

ft. into the air, handle 450 lbs. at any radius without outriggers and 1000 lbs. with outriggers. It is completely insulated. More from Pitman Mfg. Co., 300 West 79th Terrace, Kansas City 14, Mo., or circle No. 2-8 on the coupon.

Trafficones with Flashing Red Lights

To make the use of traffic cones as efficient at night as during the day, a special light has been designed which will fit any size of traffic cones, can be purchased separately and installed easily. The flashing light can be seen beyond the reach of car headlights. Operated from a standard 6-volt battery, the flasher will run 2 days continuously and up to 7 days intermittently. Switch location is easily accessible and the flasher is completely weatherproof. More from Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark, N. J., or circle No. 2-6 on the coupon.



Trafficone with flasher top commands driver attention during day or night

Fully Automatic Batch-Type Bituminous Paving Mixer

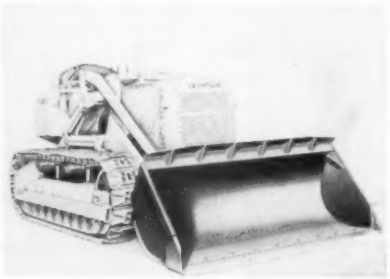
Here is a bituminous mix plant that is fully automatic, with some almost startling features. The plant can be preset for all-day production of the same mix in repetitive cycles, but can be switched instantly to a different mix, and back again to the original, without any delay. Also, it is instantly convertible from automatic to manual operation; and the cycle is automatically interrupted if there is any variation from the preset proportions. Operation is on 110-volt AC, without employment of electronic or other special devices. Weight of asphalt, of each size of aggregate and of the mineral filler may be quickly checked The plant automatically extracts a true cross-section sample of the aggregate in each bin as a part of the regular operation cycle. If not removed by the inspector, these samples are returned to the next batch. Dryers, dust collectors, elevators, etc., can be used with this mixer. More from Barber-Greene Co., Aurora, Ill., or circle No. 2-9 on the coupon.

Barber-Greene's newly developed, fully automatic Batch Plant mixes in preset cycles

Latest Loaders and Tractor-Shovels

Improved model of the Hough Payloader has a 1-yard bucket. Drive is through torque converter in combination with a new Hough-built transmission. This is one of the six Payloader models made by Frank G. Hough Co.

Increased horsepower and greater travel speeds are among the improvements of the Traxcavator No. 6 Shovel. New hydraulic pump raises hydraulic system pressure to 1450 psi. Engine is 100 hp; bucket capacity is 2¼ cu. yds.



Speed swing loader, manufactured by Pettibone Mulliken Corp., is made in ¾ and 1-yd. bucket models; and has optional 4-wheel steer. Load can be discharged to front, right or left. Attachments include 4-yd. snow bucket

The 1955 model Davis front end tractor loader at work. Many new features have been added as compared to older models. The 101 series fits 2-3 plow tractors; series 102 fits 3-4 plow tractors. Many attachments are made

Vibratory Roller for Soil Compaction

This roller consists of a roll drum with a built-in vibrating element. Vibrating frequency of 1600 rpm results in centrifugal force of 7 tons, though the roller and frame weigh only 3 tons. Roller width is 58 ins. Strata substantially deeper than 3 ft. have been compacted, some tests at 5-ft. depths showing an increase in soil density of 5 to 7 lbs./ft. after two static and 4 dynamic passes. More from Vibro-Plus Products, Inc., 54-11 Queens Blvd., Woodside N. Y., or circle No. 2-10 on the coupon.

Hopper Type Aggregate and Asphalt Spreader

Hooking quickly and positively to any standard dump or semi-dump truck, this unit will spread hot or cold plant-mix asphalt; bank run gravel; coarse or fine slag, stone or cinders; or most any other base material from a feather edge to 8 ins.

Asphalt and aggregate spreader hooks to standard dump or semi-dump truck

thick. Laying width is 8 ft., and blocking off is easy for narrower strips. A strike-off unit, riding on runners 6 ft. long, insures consistent and accurate spread. More from Good Roads Machinery Corp., Minerva, Ohio, or circle No. 2-11 on the coupon.

Portable Air Compressor for Any Tractor Power Takeoff

This portable air compressor can be attached to the power takeoff of any tractor and will furnish compressed air for many on-the-job operations in construction, bridge painting, pumping, etc. Capacity is 2 cfm at 400 rpm with pressure to 120 psi. Relief valve and pressure chamber are available. More from Worthington Mower Co., Stroudsburg, Pa., or circle No. 2-12 on the coupon.

How to Erase Those Old Traffic Lines

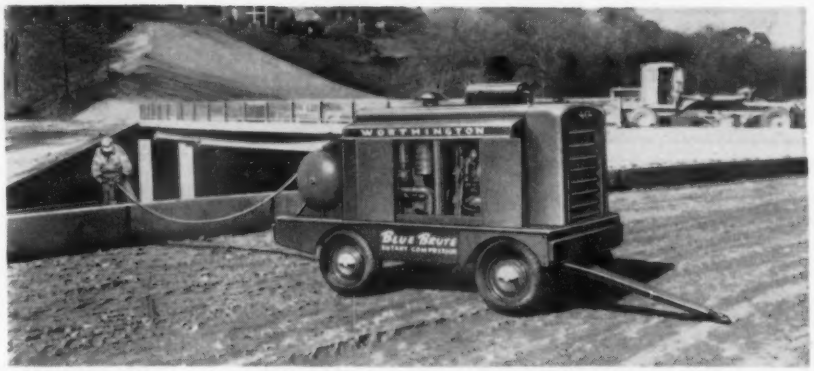
Much needed and very handy, this light, compact and easily handled machine rapidly shaves off the paint from center lines, crosswalks, parking lanes, stop lines and meter zones. It saves many manhours of work and eliminates the need for burning or hand scraping. Adjustable for lines up to 8 ins. wide, it is one-man operated. More from G. H. Tennant Co., 2578 N. Second St., Minneapolis 11, Minn., or circle No. 2-13 on the coupon.

Erasing traffic lines in one operation with a paint shaver

Street Light Service Truck

The Chicago Park District uses this special unit for replacing defective lamps and washing light globes. The platform can be raised to 30 ft. above the street and traversed 6 ft. to either side of center. There is a propane-fired hot water heater, pressure pumps, detergent spray units and a hot air dryer. A water supply of 120 gals. is carried. More from Twin Coach Co., Kent, Ohio, or circle No. 2-14 on the coupon.

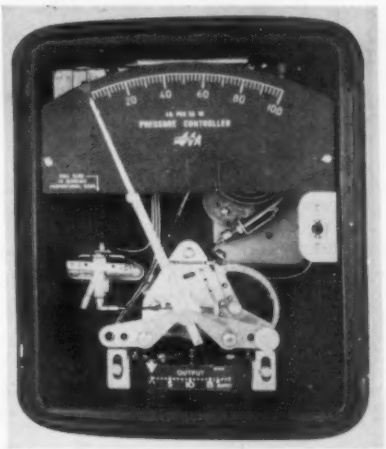
Street light servicing unit has a telescoping work tower



Portable rotary compressor with 315-ft capacity is added to Worthington line.

Indicating Controller has Water Works Applications

This is an indicating controller which has many uses in industrial processes and also in water treatment plant operation where it can be employed for controlling the level of sedimentation basins and of clear wells and for maintaining the desired depth of water on filters. Case size is only about 11 by 9 by 5 ins., but all standard Foxboro measuring elements are easily accommodated. More from Foxboro Co., Foxboro, Mass., or circle No. 2-15 on the coupon.



Controller has on-off or throttling action, lengthened indicating scale

It Is Easy to Drain a Hydrant

Operating by a 6-volt motor and air compressor connected to the battery of a service car, truck or tractor, this jet drain unit is said to remove the water completely from a hydrant in one minute. It is necessary only to insert in the water port of the hydrant, a hose connected to the Jet Drain fitting and then plug in the air jet valve. The unit comes complete in a neat steel box, with accessories. More from Ellis & Ford Mfg. Co., Inc., Ferndale 20, Mich., or circle No. 2-16 on the coupon.

Hydrant draining unit operated by an air compressor expels water quickly

International Harvester Co., Chicago, Ill., has introduced a new 140-hp gasoline engine, the "Black Diamond 264." It is designed to power trucks in the 14,000 to 17,000 GVW range and highway tractors of 29,000 GVW. Many new design features are said to contribute to better efficiency. For more data circle No. 2-17 on the coupon.

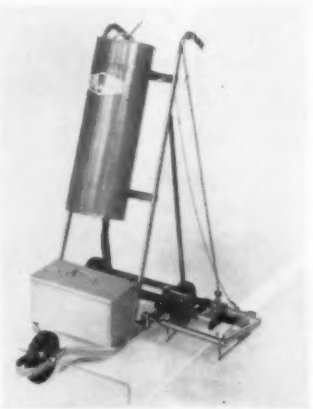
High Speed Compact 3/8-Yd. Excavator

With this entirely new unit, crane, shovel and trench hoe rigs are available on rubber tires or crawlers. Attachments include dragline, clamshell, magnet, pile driver, grapple and concrete bucket. Lifting capacity is 6 tons with 25-ft. boom at 10 ft. As a shovel, the "Dixie" can dump at 13 ft.; as a trench hoe, it can cut 13½ ft. below ground. Controls are hydraulic; the bucket has a power operated dipper trip. Complete data from Dixie Crane & Shovel Co., 2343 North 7th St., Harrisburg, Pa., or circle No. 2-18 on the coupon.

CLASSIFIED ADVERTISING AND JOB OPPORTUNITIES

Traffic Liner Handles Many Jobs

In this traffic liner there are really three liners in one. If the brush is placed on the left side of the wheel, diagonal parking lines can be marked right out from the curb. With the brush on the right side of the wheel, ordinary straight lines



Traffic line marker with the brush set for diagonal lines

can be laid down. An attachment permits marking all kinds of athletic fields. The tank capacity is 5 gals., either paint or whitewash. Fine controls permit proper amount of marker to be placed. More from Weaver Machine Co., Box 1224, York, Pa., or circle No. 2-19 on the coupon.

Speeding Up Traffic Sign and Signal Repair

Mounted on a small truck, this loader elevates a workman to a comfortable working position for maintenance or repairs to traffic signs and signals and street lights. Los Angeles has recently ordered eight of these special units to speed

Inverted tailgate loader is used for elevated servicing

up installation and repair work. More from Ven Corp., 2832 Newell St., Los Angeles 38, Calif., or circle No. 2-20 on the coupon.

Angle Dozer, Loader, Scarifier and Sidewalk Plow by Teale

New equipment announced by Teale & Co. include an angle-dozer, a new heavy-duty loader, a fully hydraulic scarifier and a sidewalk snow plow to use with the loader. The angle dozer employs a new design which reduces weight and gives close control. The loader, like the other equipment, mounts on IHC, A-C, Oliver and Caterpillar tractors, and has a 9-ft. bucket clearance. The scarifier rips from 5

Improved heavy-duty Teale loader features increased strength, higher lift

to 7 ft. wide in rocky or frozen soil, clay, macadam or shale. More from Teale & Co., Box 303, Omaha, Nebr., or circle No. 2-21 on the coupon.

Traveling Gravel Screening & Crushing Plant

The Universal Traveler plant screens, crushes and loads gravel. It is easily transported, even to out-of-the-way locations, and can be backed up to a gravel bank and fed by shovel or dragline, or by trucks from a ramp. Oversize from the screen is scalped to a jaw crusher. More from Universal Engrg. Corp., Cedar Rapids, Iowa, or circle No. 2-22 on the coupon.

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Association Meetings

The Ohio Sewage & Industrial Wastes Treatment Conference will hold its annual meeting at the Desh-ler-Hilton Hotel, Columbus, O., June 22-24. Ward Conrad, 301 Ohio Departments Bldg., Columbus 15, O., is secretary.

The Sixth annual Conference of City Engineers and Public Works Officials will be held at the Memorial Union, Ames, Iowa, Feb. 10 and 11. This meeting is co-sponsored by the Iowa Chapter, APWA and the Civil Engineering Department, Iowa State College.

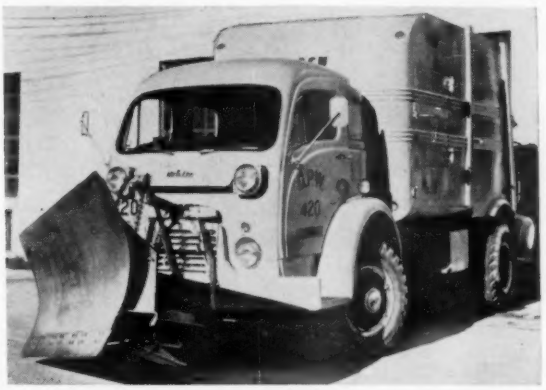
New York Saves Maintenance Costs With Corrosion-Resistant Street Sign Frames

One of the maintenance problems for Manhattan's Public Works department is keeping thousands of street name plates in legible condition. Rust from the sign frames presently used, caused by corrosive exhaust fumes and other air pollutants, migrates from the frame onto the sign plate itself, obliterating the lettering and in some cases attacking the plate metal. Annual costs for repairing and replacing rusted signs and frames is estimated to be close to $250,000.

A Borough program aimed at beautifying the City's streets at less cost to taxpayers includes the installation of new street sign frames and fixtures made of "Tenzaloy", a new alloy of the aluminum-zinc-magnesium type. The supplier of "Tenzaloy", Federated Metals Division, American Smelting and Refining Company claims the metal, used for this purpose, will be maintenance free for fifteen years. The Borough of Manhattan plans eventually to install 14,000 of these sign frames and fixtures fabricated under their specifications at the direction of the supplier, Municipal Street Sign Co., Inc. of Brooklyn. This type of installation has been appearing in the other Boroughs of Richmond at the rate of 5,000 per year.

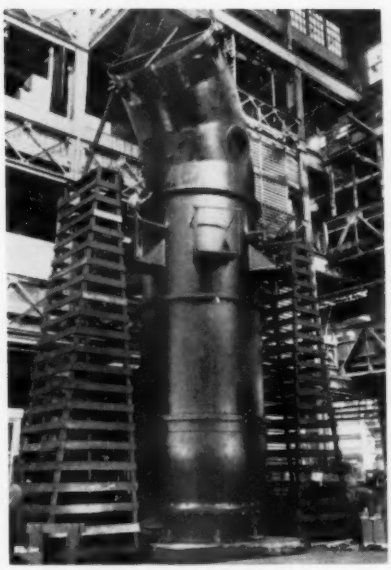
INDEX OF ADVERTISEMENTS

—Worth Seeing



One of a fleet of 22 White trucks, placed in service by Milwaukee, can be used for snow or refuse work. They are equipped with snow-plow mountings for dual purpose operation.

Here's a stretch of the old Cochabamba-Santa Cruz highway (?) before completion this past summer. The Caterpillar dealer's jeep is having a battle.



First of seven Mixflo Vertical Turbine Pumps nearing completion at Worthington Corp., Harrison, N. J., plant. Will be used for floodwater pumping in Ky.

Checking to guard against leakage, in or out, of this intake line for cooling generators of the Bd. of Water & Light, Lansing, Mich. This reinforced concrete 84" pipe line has TYLOX rubber gaskets (Hamilton-Kent Co., Kent, O.)

WORTH TELLING

by Arthur K. Akers

★ THE DORR COMPANY, Stamford, Conn., and Oliver United Filters Inc. have merged as Dorr-Oliver Inc. Resulting personnel changes include: C. W. Crumb of Oliver to sales promotion manager of the enlarged firm; A. L. Morris, long Dorr advertising manager, moves up to director of public relations.

★ LE TOURNEAU-WESTINGHOUSE CO., Peoria, Ill., purchases plant and assets of J. D. Adams Manufacturing Co., Indianapolis. After stockholder and legal approvals, the latter will be known as the Adams Division.

★ A. REED WILSON CO., Kansas City, invited us to a luncheon there on Dec. 16 where the WB "Manhole Adapter," lately standardized upon by Kansas City, was demonstrated and discussed. Reed McKinley, its director of public works, and numerous utility and consulting engineers participated. We hated to miss it.

★ DAVOL H. MEADER is appointed advertising manager, B-I-F Industries, Providence; succeeding Dexter Chafee who enters other business. Nostalgia stirred in our half-New England blood as we read the roster of Davol's schools!

Mr. Meader

Mr. Blank

★ ARTHUR S. BLANK now heads Modern Swimming Pool Company's (White Plains, N. Y.) department of water analysis and bacteriology. He was formerly chief chemist, Connecticut state department of health. At Modern he well be available for consultation by pool owners and operators on all water treatment matters.

★ AIR PLACEMENT EQUIPMENT CO., Kansas City, (Bondactors and Mix-Elevators) having outgrown its former sales set-up is establishing additional dealer-distributorships on a franchise basis. All sales are to be made henceforth through them.

Mr. Schwanhausser

★ WORTHINGTON CORPORATION, Harrison, N. J., announces Edwin J. Schwanhausser as president, succeeding Hobart C. Ramsey, now chairman of the board. Walther H. Feldman moves up from vice president, sales, to executive vice president. Worthington has also inaugurated an unique exhibit of basic industrial machinery at 99 Park Ave., New York, with Lester L. Gardner of the advertising department in charge.

★ LUDLOW VALVE MANUFACTURING CO., Troy, N. Y., has purchased Rensselaer Valve Co., also of Troy. Operations and most of the personnel of Rensselaer will gradually be moved to the Ludlow plant, it is announced.

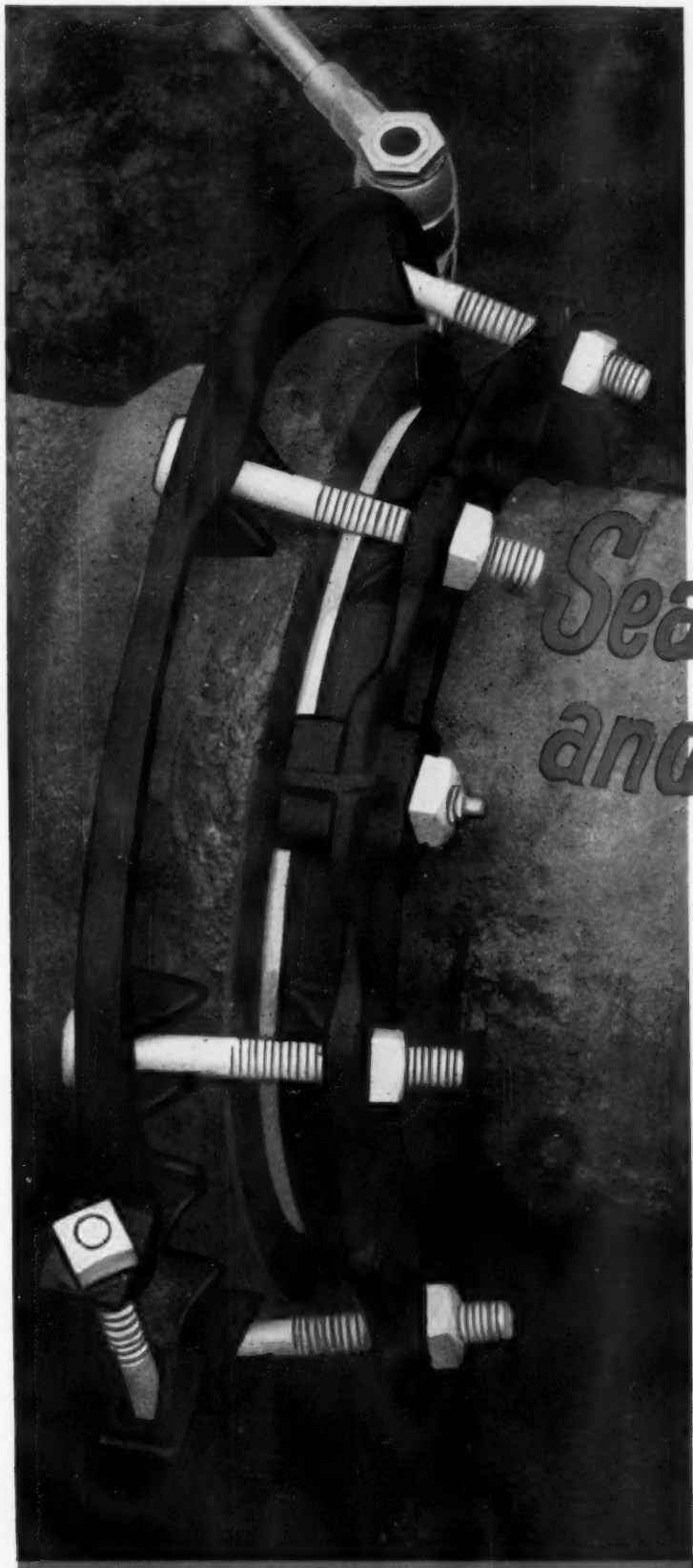
★ SIMPLEX VALVE & METER CO. moved Dec. 29 from Philadelphia to 7 East Orange Street, Lancaster, Pa.

★ LE ROI DIVISION, Westinghouse Air Brake Co., in Milwaukee, announces Don S. Permar as field sales manager, a newly created post.

★ HOMELITE CORPORATION, Port Chester, N. Y., promotes Richard C. McDonald to vice president, manufacturing; Albert K. Newman to vice president, engineering.

★ TWO DRUNKS were weaving along a railroad track. "Longest stairs I ever climbed," complained one. "Yesh," said the second, "but it's these low handrails that get me."

—Marion Groundhog



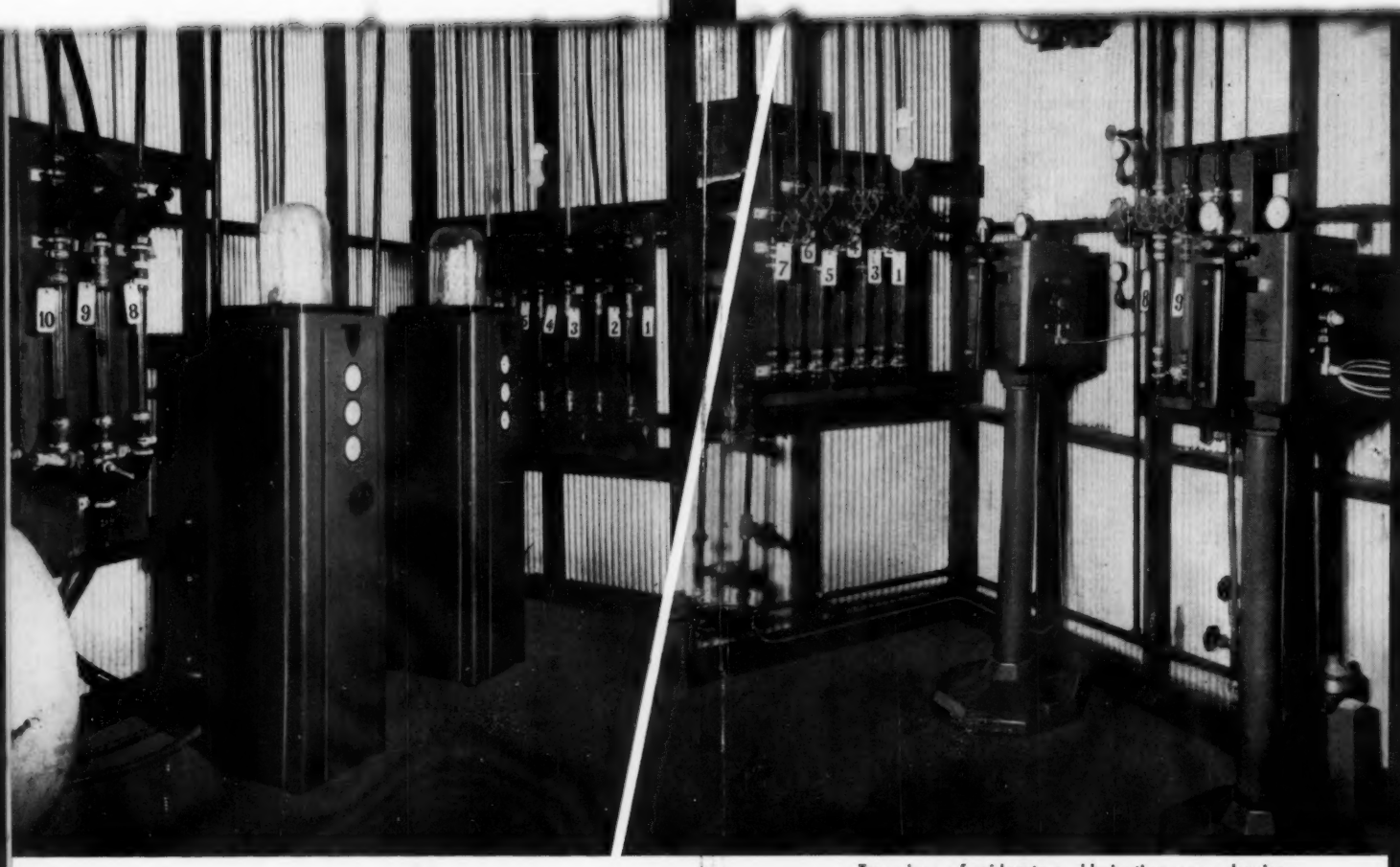
THE CLAMP WITH THE *Sealed Gasket and 3/4" Bolts!*

SKINNER-SEAL Bell Joint Clamps stop bell and spigot joint leaks under pressure. Speedy one-man installation cuts repair costs.

Gasket is completely SEALED and protected; at the bell face by a Monel Metal Seal Band; at the spigot by hard, vulcanized gasket tip, acting as a plug. Equalized pressure forces gasket into every crevice in the joint, sealing the leak at its source. Sturdy malleable iron Compression and Anchor Rings—shaped and pressure-tested before shipping. Large 3/4" bolts. Plated or unplated. Malleable iron bolts furnished on special request.

M. B. SKINNER CO.
Est. 1898
SOUTH BEND 21, INDIANA

SKINNER-SEAL BELL JOINT CLAMP



Two views of midwestern chlorinating room showing typical use of W&T equipment to suit a specific need.

To Every Part Its Proper Place . . .

How well chlorination equipment does its job depends not only on proper design but on the selection of the right parts and materials for every specific purpose.

The W&T equipment in the above installation is still giving good service after fifteen years. Every part in the equipment shown was designed specifically to meet a particular need. Mechanical diaphragms, first used by W&T in 1913, are here used for accurate control in the ammoniators. Puncture proof water diaphragms provide visibility and accessibility of control parts in the chlorinators. Both orifice and manometer type meters, and rotameters (furnished in W&T equipment as early as 1917), are employed here as best suiting the purpose for which each was intended.

Since 1913, W&T research has consistently sought out new designs, principles, and materials. Every new development is placed under rigid field tests to prove it can meet the exacting standards and practical limitations that dependable and economical chlorination demands.

When you depend on W&T equipment, you have the assurance that 40 years of experience in the chlorination field is being used to bring you the best in design, parts, and materials—selected and tested specifically to fit the need.

"Make Your First Choice Chlorination That Lasts"

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

S-93